

SERVICE & OPERATING MANUAL



RHDB2

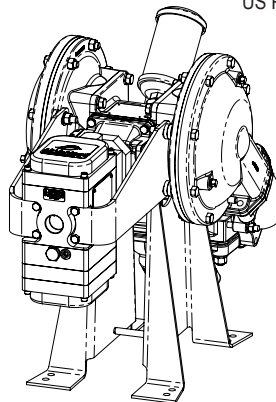
Hazardous Duty Heavy Duty Ball Valve AirVantage Design Level 1

Table of Contents

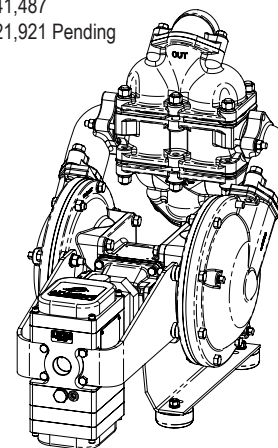
SAFETY PRECAUTIONS

Engineering, Performance and Construcion Data	1
Explanation of Pump Nomenclature	2
Performance Curve	3
Dimensions.....	4
Important Installation Information	5
Principle of Pump Operation.....	7
Principle of AirVantage	7
Installation and Start-Up	7
Air Supply	7
Air Line Moisture.....	7
Air Valve Lubrication.....	7
Air Inlet and Priming	7
Between Uses	7
Pump Troubleshooting.....	9
AirVantage Troubleshooting	10-11
Composite Repair Parts List	12
Composite Repair Parts Kits	13
Composite Repair Parts Drawing: Wetted Side.....	14
Diaphragm and Check Valve Servicing	15
Composite Repair Parts Drawing: Air Side.....	16

US Patent # 6,241,487
US Patent # 7,521,921 Pending



BOTTOM PORTED



TOP PORTED

CE 0518

Ex II 2GD T4

Ex d ib IIB T4 Gb
Ex tb IIIC 135°C Db IP66
-20°C to +40°C
Sira 10ATEX1151X
IECEX SIR 10.0110X

SP 2350863
C US

Class I Div 1 - Groups C,D T4
Class II Div 1 - Groups F,G
Class I Zone 1, Ex d ib IIB T4
Class I Zone 1, AEx d ib IIB T4
Enclosure Type 4X
12 Volt (2 - 8) mA

Intermediate and AirVantage Sensor Servicing	17
Air Valve Servicing, Assembly Drawings and Parts List	18
Air Valve Servicing with Stroke Indicators, Assembly Drawings and Parts List	19
Pilot Valve and Actuator Plunger Servicing	20
Pulse Output Kits and Drawing	21
Composite Repair Parts Drawing - AirVantage Unit	23
AirVantage Servicing - Pilot Valve and Pressure Regulator	24
AirVantage Servicing - Power Generation Module	25
AirVantage Servicing - Control Module	26
AirVantage Servicing - Sensor Assembly	27
AirVantage Servicing - Poppet Valve Drawing.....	28
AirVantage Servicing - Poppet Valve	29
AirVantage Servicing - Check Valve	30
Grounding the Pump	31
Pumping Hazardous Liquids - Shutdown Procedure	32
Converting the Pump for Piping Exhaust Air	32
Material Codes for the Last 3 Digits of the Part Number	33
CE Declaration of Conformity - Machinery	34
CE Declaration of Conformity - ATEX.....	35
Declaration of Conformity - IECEX.....	36

Cautions - Read Operating and Safety Precautions First



! IMPORTANT

Before installation and start-up of the pump read these safety warnings and instructions in this manual completely. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.



! CAUTION

Before pump operation, inspect all gasketed fasteners for looseness caused by gasket creep. Retorque loose fasteners to prevent leakage. Follow recommended torques stated in this manual.



! CAUTION

Pump not designed, tested or certified to be powered by compressed natural gas. Powering the pump with natural gas will void the warranty.



! WARNING

Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. The discharge line may be pressurized and must be bled of its pressure.



! WARNING

In the event of diaphragm rupture, pumped material may enter the air end of the pump, and be discharged into the atmosphere. If pumping a product which is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe disposition.



! WARNING

Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded. (See page 30)



! WARNING

This pump is pressurized internally with air during operation. Always make certain that all bolts are in good condition and that all of the correct bolts are reinstalled during assembly. Do not open when an explosive atmosphere may be present.



! WARNING

When used for toxic or aggressive fluids, the pump should always be flushed clean prior to disassembly.



! WARNING

Before doing any maintenance on the pump, be certain all pressure is completely vented from the pump, suction, discharge, piping, and all other openings and connections. Be certain the air supply is locked out or made non-operational, so that it cannot be started while work is being done on the pump. Be certain that approved eye protection and protective clothing are worn at all times in the vicinity of the pump. Failure to follow these recommendations may result in serious injury or death.



! WARNING

Airborne particles and loud noise hazards. Wear ear and eye protection.



! WARNING

Substitution of components may impair intrinsic safety.



! WARNING

Use safe practices when lifting

Recycling

Warren Rupp is committed to protecting the environment and preventing pollution for the benefit of our employees, as well as local and global communities, now and in the future.

Many components of SANDPIPER® Metallic AODD pumps are made of recyclable materials (see chart on page 32 for material specifications). We encourage pump users to recycle worn out parts and pumps whenever possible. Follow all applicable guidelines if hazardous material has been pumped.



Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. The WEEE marking applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC. Contact your local waste recovery agency for a designated collection facility in your area.



None of the equipment supplied within the AirVantage unit either use or exceed the amounts stated above hazardous substances. A signed declaration from our supplier of the electronic/electrical portion of the AirVantage unit will be held on file stating their adherence to the RoHS, 2002/95/EC regulation.



The enclosure is non-conducting and may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

Special Conditions for Safe Use:

- For the safe operation of the equipment, it is necessary for the air supply line to be in a safe area
- The cable entry hole should be fitted with a suitably certified cable gland
- For the safe operation of the equipment, the pneumatic pump should be grounded
- The enclosure is non-conducting and may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high pressure steam) which might cause a build-up of electrostatic charge on the non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.

**WARREN
RUPP, INC.**

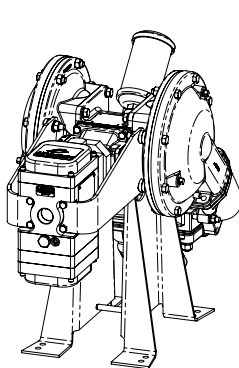


intertek

Total Quality. Assured.

ISO 9001 Certified
ISO 14001 Certified

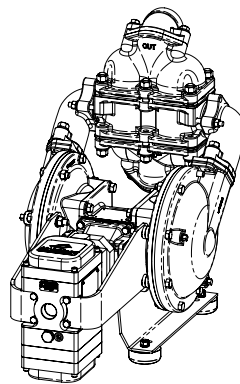
**IMEX
CORPORATION**



BOTTOM PORTED

US Patent # 6,241,487

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TOP PORTED

CE 0518

Ex II 2GD T4

Ex d ib IIB T4 Gb

Ex tb IIIC 135°C Db IP66

-20°C to +40°C

Sira 10ATEX1151X

IECEX SIR 10.0110X

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Class I Div 1 - Groups C,D T4

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Class I Zone 1, Ex d ib IIB T4

Class I Zone 1, AEx d ib IIB T4

Enclosure Type 4X

12 Volt (2 - 8) mA

SANDPIPER®

A WARREN RUPP, INC. BRAND

RHDB2 Hazardous Duty AirVantage Design Level 1 Heavy Duty Ball Air-Operated Double Diaphragm Pump

ENGINEERING, PERFORMANCE
& CONSTRUCTION DATA

INTAKE/DISCHARGE PIPE SIZE 2" NPT (internal)	CAPACITY 0 to 130 gallons per minute (0 to 492 liters per minute)	AIR VALVE No-lube, no-stall design	SOLIDS-HANDLING Up to 3/8 in. (9mm)	HEADS UP TO 125 psi or 289 ft. of water (125 psi or 8.6 bar inlet) (8.6 bar or 88 meters)	DISPLACEMENT/STROKE .47 Gallon / 1.77 liter
CAUTION! Operating temperature limitations are as follows:					
Materials				Operating Temperatures	
				Maximum	Minimum
Nitrile: General purpose, oil-resistant. Shows good solvent, oil, water and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons and nitro hydrocarbons.				190° F 88° C	-10° F -23° C
EPDM: Shows very good water and chemical resistance. Has poor resistance to oil and solvents, but is fair in ketones and alcohols.				280° F 138° C	-40° F -40° C
Neoprene: All purpose. Resistant to vegetable oil. Generally not affected by moderate chemicals, fats, greases and many oils and solvents. Generally attacked by strong oxidizing acids, ketones, esters, nitro hydrocarbons and chlorinated aromatic hydrocarbons.				200° F 93° C	-10° F -23° C
Santoprene®: Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance.				275° F 135° C	-40° F -40° C
Virgin PTFE: Chemically inert, virtually impervious. Very few chemicals are known to react chemically with PTFE- molten alkali metals, turbulent liquid or gaseous fluorine and a few fluoro-chemicals such as chlorine trifluoride or oxygen difluoride which readily liberate free fluorine at elevated temperatures.				220° F 104° C	-35° F -37° C
FKM (Fluorocarbon): Shows good resistance to a wide range of oils and solvents; especially all aliphatic, aromatic and halogenated hydrocarbons, acids, animal and vegetable oils. Hot water or hot aqueous solutions (over 70°F) will attack FKM.				350° F 177° C	-40° F -40° C
Polypropylene:				180° F 82° C	32° F 0° C
UHMW Polyethylene:				180° F 82° C	32° F 0° C

For specific applications, always consult The Warren Rupp Chemical Resistance Chart

SANDPIPER® pumps are designed to be powered only by compressed air.

Explanation of Pump Nomenclature, RHDB2 Hazardous Duty Ball Valve

Top Porting	Bottom Porting	Manifold	Outer Chamber	Inner Chamber	Outer Diaphragm Plate	Inner Diaphragm Plate	Intermediate Housing	Diaphragm Rod	Valve Seat	Hard-ware	Diaphragm	Ball Valve Material	Manifold Seat Gasket	Manifold Sealing Rings	Shipping Wt. (lbs.) Top P	Shipping Wt. (lbs.) Bottom P	AirVantage Options
TB-3-A	DB-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	B	B	CB	B	105	112	Y
TC-3-A	DC-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	V	T	CT	V	105	112	Y
TI-3-A	DI-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	I	I	CT	I	105	112	Y
TN-3-A	DN-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	N	N	CN	N	105	112	Y
TGI-3-A	DGI-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	I/T	T	CT	V	105	112	Y
TGN-3-A	DGN-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	N/T	T	CT	V	105	112	Y
TGR-3-A	DGR-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	H/T	T	CT	V	105	112	Y
TS-3-A	DS-3-A	AL	AL	AL	CI	PS	AL	SS	SS	PS	S	S	CT	I	105	112	Y
TB-3-I	DB-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	B	B	CB	B	151	161	Y
TC-3-I	DC-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	V	T	CT	V	151	161	Y
TI-3-I	DI-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	I	I	CT	I	151	161	Y
TN-3-I	DN-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	N	N	CN	N	151	161	Y
TGI-3-I	DGI-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	I/T	T	CT	V	151	161	Y
TGN-3-I	DGN-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	N/T	T	CT	V	151	161	Y
TGR-3-I	DGR-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	H/T	T	CT	V	151	161	Y
TS-3-I	DS-3-I	CI	CI	AL	CI	PS	AL	SS	SS	PS	S	S	CT	I	151	161	Y
TB-3-S	DB-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	B	B	CB	B	166	173	Y
TC-3-S	DC-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	V	T	CT	V	166	173	Y
TI-3-S	DI-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	I	I	CT	I	166	173	Y
TN-3-S	DN-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	N	N	CN	N	166	173	Y
TGN-3-S	DGN-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	N/T	T	CT	V	166	173	Y
TGR-3-S	DGR-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	H/T	T	CT	V	166	173	Y
TS-3-S	DS-3-S	‡SS	‡SS	AL	SS	PS	AL	SS	SS	PS	S	S	CT	I	166	173	Y

Meanings of Abbreviations:

A = Compressed Fibre
AL = Aluminum
B = Nitrile
CB = Conductive Nitrile
CI = Cast Iron

CN = Conductive Neoprene
CT = Conductive PTFE
DC = Die Cast
H/T = Hytrel® Backup/PTFE Overlay

I = EPDM
I/T = EPDM Backup/PTFE Overlay
N = Neoprene
N/T = Neoprene Backup/PTFE Overlay
PS = Plated Steel

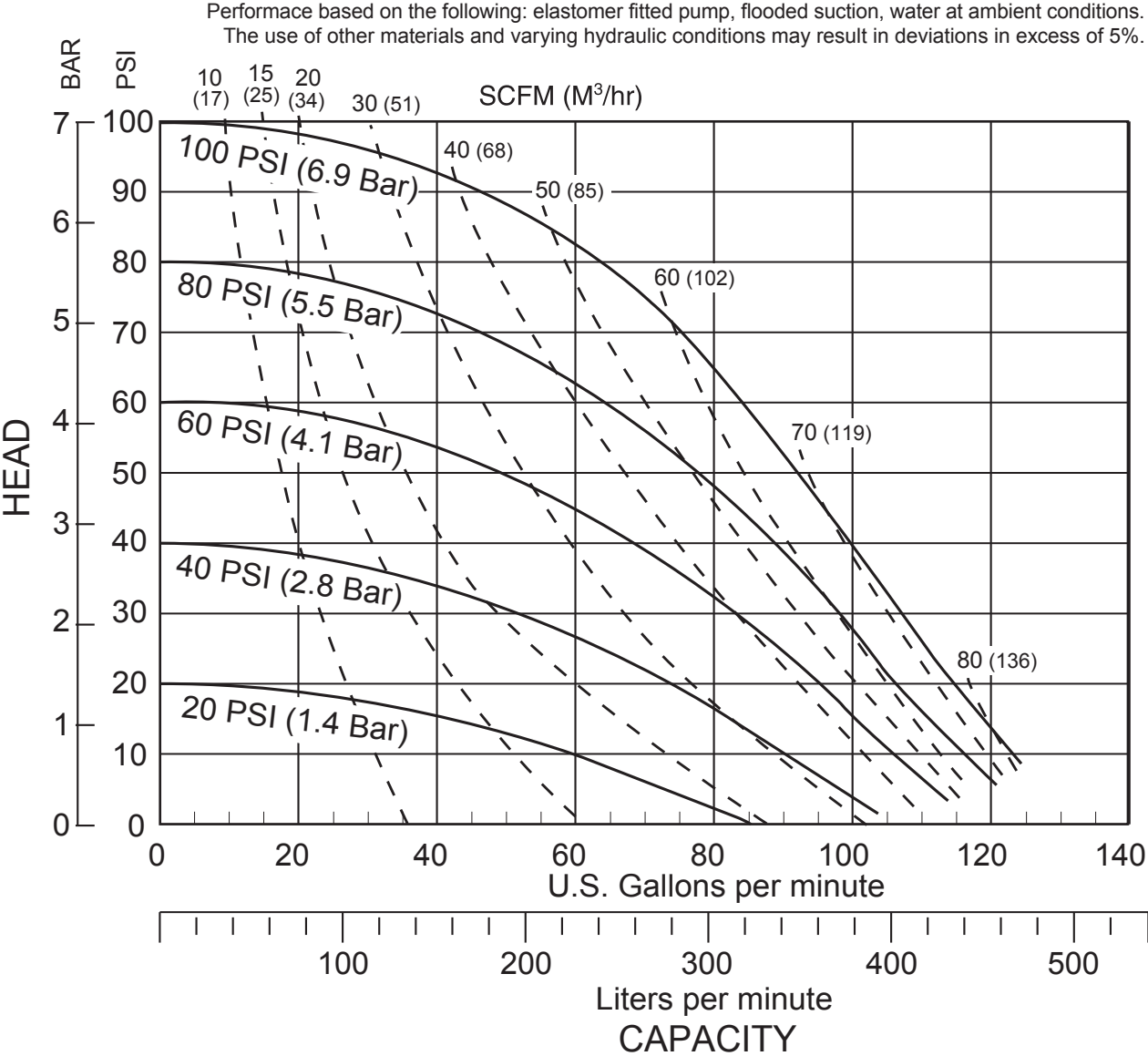
S = Santoprene®
SS = Stainless Steel
T = PTFE
V = FKM

X = AirVantage
ATEX Certified
Y = US Hazardous Duty

‡ **CF-8M Stainless Steel** equal to or exceeding ASTM specification A743 for corrosion resistant iron chromium, iron chromium nickel, and nickel based alloy castings for general applications. Commonly referred to as 316 Stainless Steel in the pump industry.

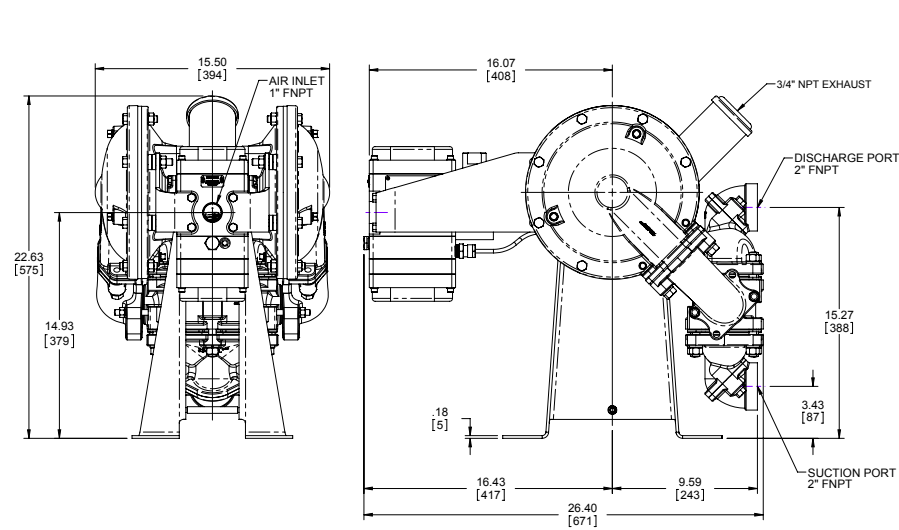
Santoprene is a registered tradename of Exxon Mobil Corp.
Hytrel is a registered tradename of E.I. du Pont.

Performance Curve, RHDB2 Hazardous Duty Ball Valve

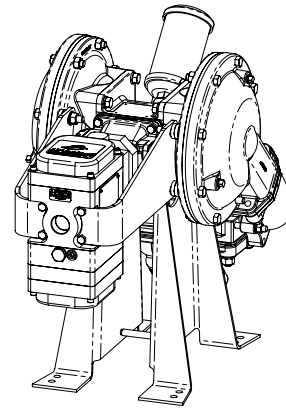
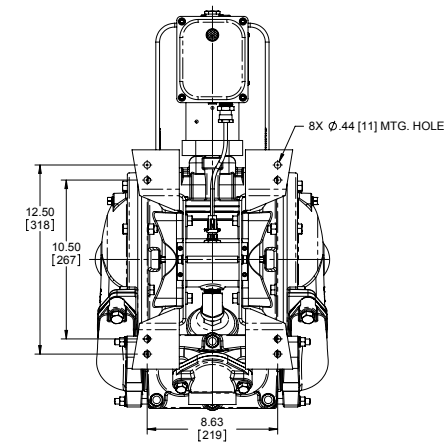


Dimensions: RHDB2 Hazardous Duty Bottom Ported

Dimensions are ± 1/8"
Figures in parenthesis = millimeters

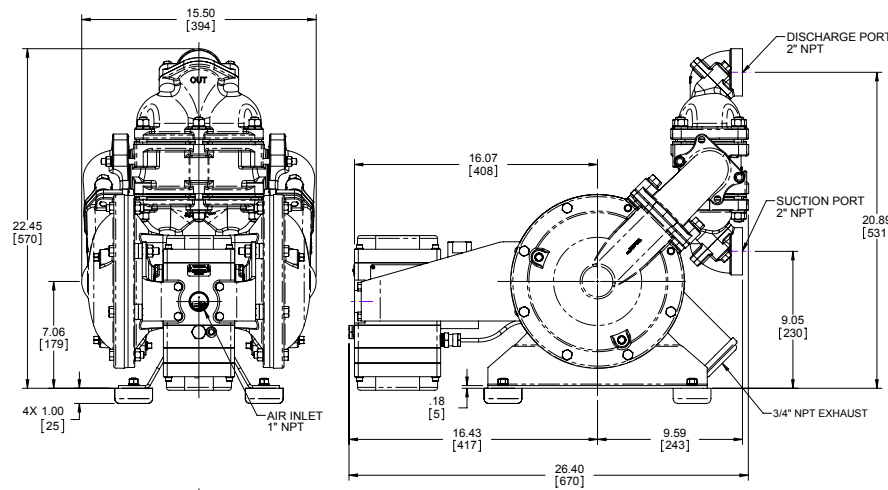


SUCTION AND DISCHARGE PORTS ARE AVAILABLE WITH 2" BSP CONNECTIONS
SUCTION AND DISCHARGE PORTS CAN BE ROTATED 90° FOR VERTICAL PORTING

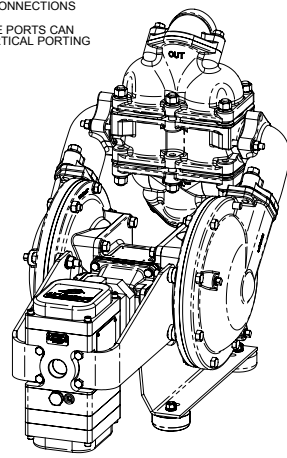
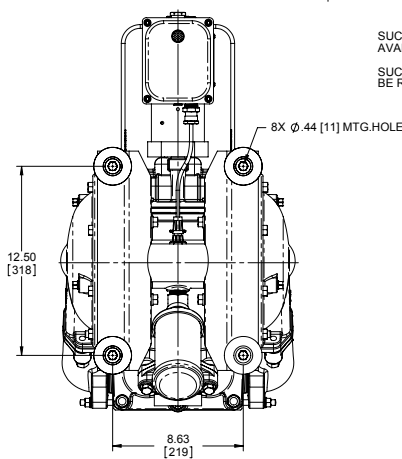


Dimensions: RHDB2 Hazardous Duty Top Ported

Dimensions are ± 1/8"
Figures in parenthesis = millimeters



SUCTION AND DISCHARGE PORTS ARE AVAILABLE WITH 2" BSP CONNECTIONS
SUCTION AND DISCHARGE PORTS CAN BE ROTATED 90° FOR VERTICAL PORTING



Important Installation Information

Use of the standard AODD Installation Guide is recommended for pumps fitted with AirVantage technology. Install shut-off valves on both the suction and discharge of the pump. (This will help limit the amount of product that enters the center section of the pump in the event of a diaphragm failure.) Using shut-off valves in conjunction with a drain port also provides a means of allowing the lines to be drained when maintenance needs to be conducted.

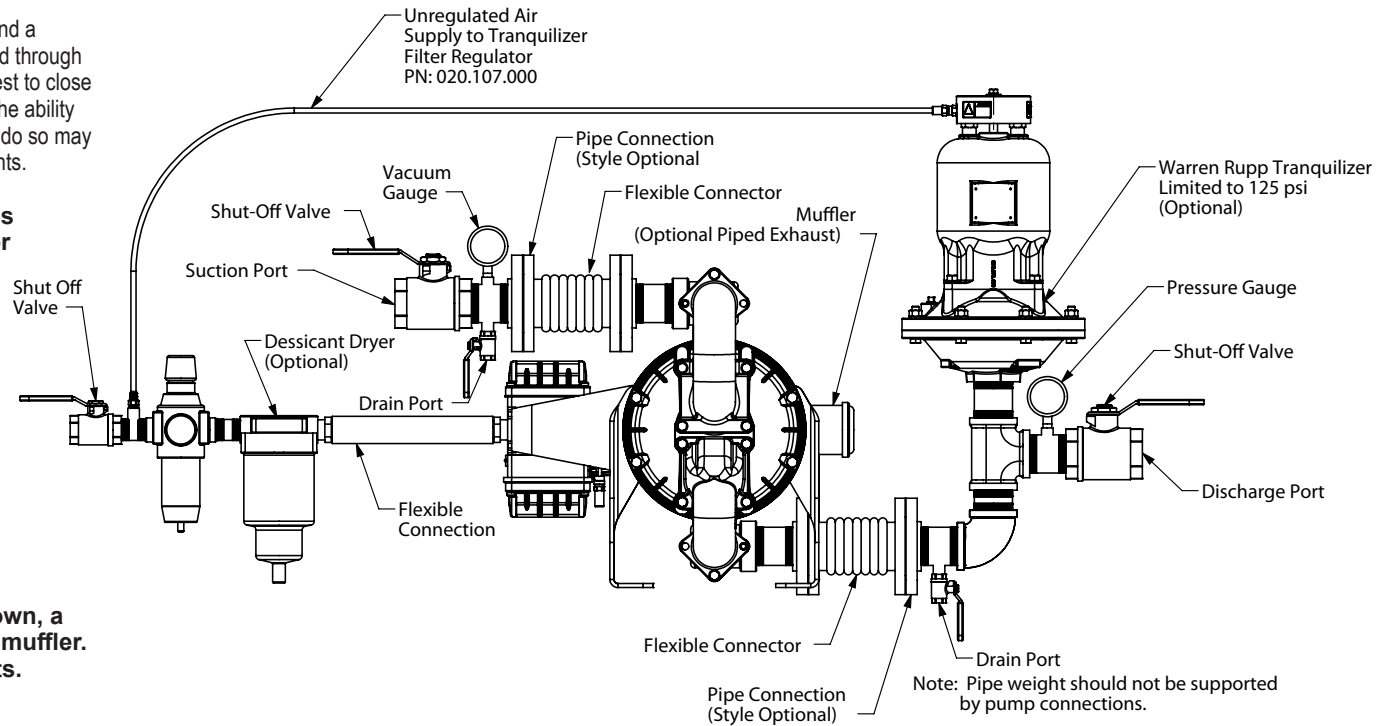
When the supply liquid level is above the air inlet of the pump, and a diaphragm fails, the pumped liquid or fumes can enter the air end through the point of failure. When a diaphragm failure is detected, it is best to close the shut-off valves and bleed the lines of product. This will limit the ability of the material being pumped to enter the AirVantage. Failure to do so may result in damage to the AirVantage and air distribution components.

If a diaphragm failure has been detected in pumps fitted with AirVantage, the following procedure for shut-down must be used:

1. Close the suction shut-off valve (this will limit any new product from entering the pump)
2. Close the discharge shut-off valve (this will stop any product from reentering the pump)
3. Close the air supply shut-off valve
4. Drain the discharge line
5. Drain the suction line
6. Perform maintenance

Caution: When performing a direct spray washdown, a plug must be installed in place of the AirVantage muffler. Failure to do so may damage internal components. (See page 23)

Suggested Installation Guide



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PRINCIPLE OF PUMP OPERATION

This ball valve fitted pump has been equipped with IDEX's patented AirVantage equipment. To fully understand the operation of the AirVantage, one must first understand the basics of Air Operated Double Diaphragm (AODD) pumps. AODD's are powered by compressed air. The compressed air is directed behind each of the flexible diaphragms by a Main Air Valve. Once the diaphragm has reached the end of its stroke, a Pilot Valve is mechanically actuated, sending an air signal back to the Main Air Valve which redirects air to the opposite diaphragm. This causes the diaphragm assemblies, which are connected by a common Diaphragm Rod, to move in a reciprocating action.

Air is directed to the inboard side of the diaphragm, which is closest to the center of the pump. This is referred to as the air side of the diaphragm. The opposite side is commonly called the fluid side. Most AODD pumps have a 1:1 ratio design. This means, when the discharge of the pump is closed completely (dead headed), the maximum pressure the pump will create will be equal to the air pressure being applied to the pump. At this point, and only at this point, the diaphragm will be completely balanced. The air pressure is equivalent to the fluid pressure and there will be no movement of the diaphragm. If the pump is stroking, then the system is not balanced. There will be more pressure applied to the air side than fluid pressure on the fluid side.

During each stroke of the pump there are two distinct operations that occur. One diaphragm is moving away from the center of the pump, moving fluid out of the Discharge Manifold, while the other diaphragm is moving toward the center, bringing fluid into the Suction Manifold. Considering that the pump has a common suction and discharge port, these two operations are separated from each other through a series of Check Valves.

PRINCIPLE OF AIRVANTAGE

AirVantage is a special air side device which uses equipment that can accurately monitor the operation of the pump. Based on the monitored information, air is metered to the correct amount to perform the work required, and NOTHING MORE.

Once the pump starts up, and the AirVantage is turned on, the LED indicator light will go through a series of patterns. Initially the light will be solid green. This indicates the AirVantage is allowing the pump to reach a steady state. Next, the light will pulse at a very rapid rate. This is called the learn phase. Learn is where the AirVantage monitors the pump in non-AirVantage mode. This will set the parameters for operation in AirVantage mode. In less than one minute, the pump will change tones. The LED indicator light will start an uneven blink when optimization has started. Optimization will be completed once the LED light is blinking in unison with the stroke rate of the pump. All this is completed without sacrificing a significant amount of flow.

INSTALLATION AND START-UP

The pump should be located near the product being pumped, in order to keep the suction line as short as possible. Minimize the number of fittings between the product and the pump and maintain the line size, if possible. Better results will always be realized if the line size of the suction line is increased by one size. It's not recommended to hook up rigid pipe directly to the pump. Some method of expansion joint or vibration isolator should be used. A Warren Rupp Tranquilizer® is recommended to reduce the pulsation in the flow. If the fluid level is more than 10 feet (3 meters) above the level of the pump, a pressure regulating device may need to be added to the exhaust of the pump (Consult the factory for recommendations).

AIR SUPPLY

The air supply pressure cannot exceed 125 psi (8.6 bar). The air line and associated components (filters, regulators, solenoid valves, etc.) should not be less than ½" (13 mm). However, ¾" (19mm) or greater is preferred. An air line filter-regulator is necessary for the AirVantage installation. The required component (PN: 020.107.000) is available through the distributor. Rigid pipe should not be hooked directly to the air inlet of the AirVantage. A flexible hose should be installed to reduce the strain. Do not let the weight of the air line components be supported by the air inlet of the pump. Failure to provide a means of supporting the weight may result in damage to the pump. If the pump will be shut down for any extended length of time, it is recommended that the air supply to the pump should be shut off.

SPECIAL CONDITIONS FOR SAFE USE

For the safe operation of the equipment, it is necessary for the air supply to come from a safe area, therefore, the supplied air shall be clean.

AIR LINE MOISTURE

Water in the compressed air supply can create problems such as icing and freezing of the exhaust air. The formation of ice in the exhaust can cause the pump to cycle erratically, degrade efficiency, or even stop the pump. Fitting the pump with the AirVantage technology reduces the exhaust temperature. This is due to more energy being extracted from every pulse of air. When more energy is extracted, the temperature of the air is reduced. Some method of air drying will be necessary. Most refrigerant dryers installed on compressors can reduce the dewpoint to about 40° F. This is normally adequate for most pumping applications. If further drying needs to occur due to internal ice build-up, a desiccant dryer can be installed. These air line dryers can lower the dewpoint to around -40° F.

AIR VALVE LUBRICATION

The air valve and pilot valve are designed to operate without lubrication. There may be instances of personal preference or when extremely dry air is being used (instrument quality or nitrogen) that a small amount of lubrication will improve the life of the rubber components being used on the air side of the pump. The lubrication may be added using an air line lubricator (¾" PN: 020.051.001 – 1" PN: 020.052.001). At the point of operation use SAE 10 weight, non detergent oil at a maximum rate of 1 drop per hour for every 20 scfm (9.4 liters/sec) of air consumption. Consult the pump curve to determine this value. The smallest amount needed is preferred.

AIR INLET AND PRIMING

To start the pump, make sure the AirVantage switch is in the off position. Increase the pressure until the pump starts to cycle. The pump stroke rate should slow slightly when the pump is primed. Once the pump is fully primed, increase the pressure at the regulator until the desired flow rate is achieved. Again, the pump curve can be used to derive this value. If increasing the pressure to the pump does not generate a higher flow rate, then cavitation has occurred. Back the regulator off slightly. To gain the most efficiency from the pump, try to run the pump fully primed at all times.

BETWEEN USES

When the pump is being used to move materials that tend to settle out or solidify, the pump should be flushed to prevent damage. The product that remains in the pump could dry and settle out. This could potentially cause damage to the diaphragms and/or check valves during restart. In freezing temperatures the pump must be completely drained between uses. Due to the addition of the new technology, it is recommended the air supply to the pump be shut off if the pump is going to be shut down for an extended length of time.



WARNING

Hazardous Duty Rating

This pump is certified to be operated in the hazardous areas listed on the front cover. To maintain this certification, only genuine, approved parts must be used and assembled in accordance to the instructions detailed in this manual by a competent person. Any deviation or modification to this will invalidate certification and may result in serious injury or death.

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PUMP TROUBLESHOOTING

⚠ CAUTION! WHENEVER TROUBLESHOOTING OR PERFORMING ANY REPAIRS ON ANY WARREN RUPP, INC. EQUIPMENT, ALWAYS REMOVE THE AIR SUPPLY LINE TO THE PUMP AND WEAR PROPER PERSONAL PROTECTIVE EQUIPMENT.

PUMP WILL NOT CYCLE

What to Check: • The system head exceeds the air supply pressure to the pump.

Corrective Action: • Increase the air inlet pressure to the pump. Most diaphragm pumps are designed for 1:1 pressure at zero flow.

What to Check: • Check ESADS+, including pilot valve assembly and main air valve assembly.

Corrective Action: • Disassemble and inspect the main air distribution valve, pilot valve, and pilot valve actuator pins. Check for scores, wear, or damaged o-rings. Replace parts as necessary. Refer to the exploded view drawing and air valve section (P.18 & 20).

What to Check: • Blocked discharge line.

Corrective Action: • Check for obstruction or closed discharge line.

What to Check: • Blocked pumping chamber.

Corrective Action: • Disassemble and inspect wetted chambers of the pump. Remove or flush any obstructions. Refer to page 14 for disassembly.

PUMP CYCLES, BUT WILL NOT FLOW OR FLOW RATE IS UNSATISFACTORY

What to Check: • Restricted or undersized air line.

Corrective Action: • Make sure there are no obstructions or restrictions in the air inlet to the pump. Install proper size air line and/or air line equipment. Refer to air supply section (p.7) air inlet plumbing recommendations.

What to Check: • Restricted or undersized suction piping.

Corrective Action: • Make sure there are no obstructions or restrictions in the suction line or related suction components such as screens or strainers. Install the proper size suction line and/or equipment. It is recommended that any suction line components and pipe size be at least the same size as the suction line thread size to the pump. Though best results will always be realized if the line size of the suction line is increased by one size. Refer to the installation section (p.5) for recommended suction plumbing recommendations.

What to Check: • Blocked air exhaust muffler.

Corrective Action: • Remove muffler, clean or de-ice and reinstall.

What to Check: • Excessive Suction Lift.

Corrective Action: • For lifts exceeding 20 feet (6 meters), filling the pump chambers with liquid will prime the pump in most cases. If not, place pump closer to fluid level.

What to Check: • Suction line cavitation.

Corrective Action: • If no obstructions are in the suction line of the pump, decrease the inlet air pressure and/or volume to the pump. This will slow down the diaphragm speed and reduce the cavitation.

What to Check: • Partially blocked exhaust muffler.

Corrective Action: • Remove muffler and make sure that some of the material being pumped has not migrated into the muffler element. If it has, replace the element or clean it and reinstall. If product has made it to the muffler, then the diaphragm assembly will need to be inspected. Refer to the Diaphragm Replacement section (p.15).

What to Check: • Suction side air leakage or air in the product.

Corrective Action: • Visually inspect all suction side gaskets, seals, as well as pipe and pipe connections.

PUMP CYCLE SEEMS UNBALANCED OR PRODUCES EXCESSIVE VIBRATION

What to Check: • Excessive flooded suction in system.

Corrective Action: • Check height of fluid above pump. For flooded conditions, exceeding 10 feet (3 meters) of liquid, install a back pressure device in the exhaust side of the pump.

What to Check: • Worn or misaligned check valve or check valve seat.

Corrective Action: • Disassemble the wet end of the pump and inspect check valves and seats for wear and proper seating. Replace them if necessary. Refer to the Check Valve section (p.15) for disassembly instructions.

What to Check: • Obstructed check valves.

Corrective Action: • Disassemble the wet end of the pump and look for obstructions that may prevent the check valve from seating on the seat. Look for damage on the valve and the seat. Replace them as necessary. Refer to the Check Valve section for disassembly (p.15).

What to Check: • Rigid pipe connections.

Corrective Action: • Install flexible pipe isolators or expansion joints between the plumbing and the pump.

What to Check: • Pulsation in the discharge line.

Corrective Action: • Excessive pulsation in the discharge line may be corrected by installing a Warren Rupp Tranquilizer Surge Suppressor.

AirVantage Troubleshooting

⚠ Caution! Whenever troubleshooting or performing any repairs on any Warren Rupp, Inc. equipment, always remove air supply line to the pump and wear proper personal protective equipment.

LED OUTPUT FOR AirVantage UNIT

<u>STATE</u>	<u>LED OUTPUT</u>
Startup/Settle/Deadhead	Solid
Standby/Low Flow	1 Second ON / 1 Second OFF
Learn Mode	0.1 Seconds ON / 0.1 Seconds OFF
Seek/Optimize	1 Second ON / 0.1 Seconds OFF
Steady State/Air Savings	OFF / ON in rhythm with Cycle Rate of Pump

AirVantage LED DOES NOT LIGHT UP AT ALL

What to Check:

- Make sure power switch on the control module is turned on, (depressed to the left)
- Make sure air is being supplied to pump or make sure 110 VAC unit has power being supplied to it

Corrective Action:

- Cycle power switch off/on
- Unplug patch cable and cycle power switch off/on
- Consult Factory After Sales Support team

AirVantage LED LIGHTS UP AND STAYS ON SOLID

What to Check:

- Make sure patch cable is plugged in and locked

Corrective Action:

- Consult Factory After Sales Support team

VALVE FIRES ONCE AND IMMEDIATELY RESETS

Corrective Action:

- Consult Factory After Sales Support team

VALVE LED NEVER LEAVES SEEK MODE - AirVantage LED PULSING IN TIME TO PUMP, BUT VALVE NOT ACTUATING AND THE PUMP IS NOT SAVING AIR

Corrective Action:

- Consult Factory After Sales Support team

UNEXPECTED OPERATING CONDITION (AIR SAVINGS OR FLOW RATE)

What to Check:

- Check for varying environmental pumping conditions (changing head or suction)
- Check ice buildup in exhaust area
- Inspect sleeve and spool set for damage

Corrective Action:

- Consult Factory After Sales Support team

PUMP CYCLING IS UNSTABLE OR ERRATIC

What to Check:

- Run pump without AirVantage and check pump operation
- Make sure pump has correct sleeve and spool set installed
- Make sure patch cable plug is connected and locked
- Make sure power wire connectors are tight

Corrective Action:

- Consult Factory After Sales Support team

PUMP RUNNING SLOWLY

What to Check:

- Run pump without AirVantage and check operation
- Cycle the power off/on to the control module to reset controller
- Check ice buildup in exhaust area
- Inspect sleeve and spool set for damage

Corrective Action:

- Consult Factory After Sales Support team
- Cycle the power switch on the control module off/on

AirVantage Troubleshooting Continued

AirVantage RESETS AND ENTERS LEARN MODE TOO FREQUENTLY

What to Check:

- Check for excessive varying environmental pumping conditions (changing head or suction)
- Check ice buildup in exhaust area
- Inspect sleeve and spool set for damage
- Make sure patch cable plug is connected and locked

Corrective Action:

- Consult Factory After Sales Support Team

PUMP STALLS, RESETS, LEARNS, SEEKS AND REPEATS

What to Check:

- Make sure patch cable plug is connected and locked
- Check ice buildup in exhaust area

Corrective Action:

- Consult Factory After Sales Support Team

PUMP MOVES OUT OF STEADY STATE AND NEVER ATTEMPTS TO RELEARN (LED ON)

What to Check:

- Make sure patch cable plug is connected and locked
- Cycle the power off/on to the control module

Corrective Action:

- Consult Factory After Sales Support Team
- Cycle the power switch on the control module off/on

WHAT TO DO IN THE EVENT OF A DIAPHRAGM FAILURE

If a diaphragm failure has been detected in pumps fitted with AirVantage, see page 5 for shut-down procedure.

What to Check:

- Has product migrated to the sensor?

Corrective Action:

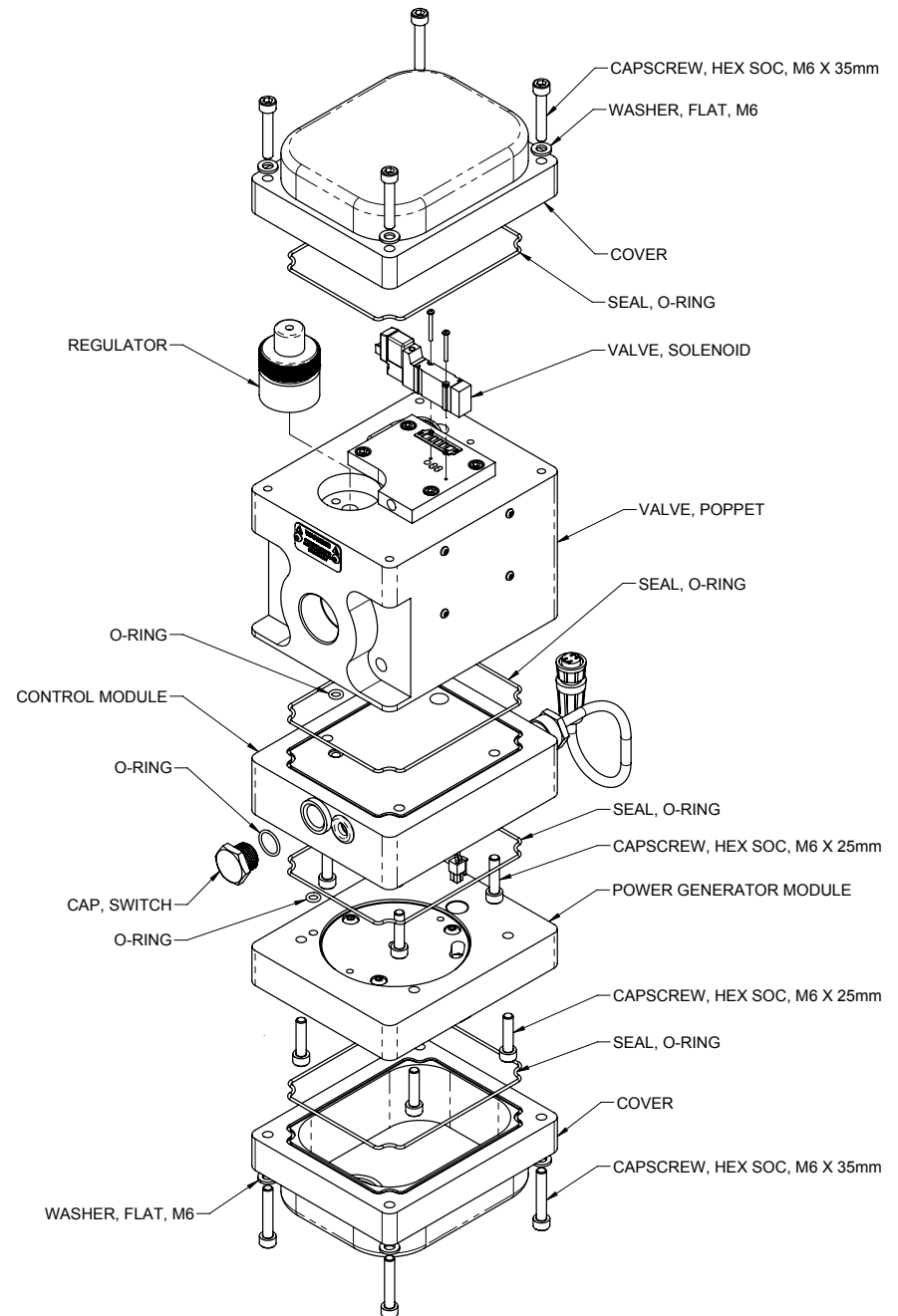
- If the sensor has been submerged in product, the sensor will need to be replaced. Consult the AirVantage servicing section of the manual for detailed instructions.

What to Check:

- Has product contaminated the check valve cartridge?

Correct Action:

- If a significant amount of product has made it into the check valve assembly, then the unit will need to be disassembled for inspection. If the check valve assembly is damaged, then it will need to be replaced. Consult parts list for information.



Composite Repair Parts List

Item	Part Number	Description	Qty	Item	Part Number	Description	Qty
1	031.019.004	Ass'y - Air Valve	1	34	518.027.156	Manifold	1
	031.098.001	Ass'y - Air Valve (Pulse Output Application)	1		518.027.010	Manifold	1
2	032.063.000	Ass'y - AirVantage	1		518.027.110	Manifold	1
3	050.017.360W	Ball, Check	4		518.027.112	Manifold	1
	050.017.364W	Ball, Check	4	35	530.041.000	Muffler	1
	050.017.365W	Ball, Check	4	36	538.108.110	Nipple, Pipe	1
	050.017.354	Ball, Check	4	37	545.004.330	Nut, Hex, 5/16-18	2
	050.018.354	Ball, Check	4	38	545.005.330	Nut, Hex, 3/8-16	4
4	070.006.170	Bearing	2	39	545.007.330	Nut, Hex, 7/16-14	4
5	095.073.001	Pilot Valve Assembly	1	40	545.008.330	Nut, Hex, 1/2-13	12
6	114.032.156 F	Bracket, Intermediate	1	41	560.001.360	O-Ring	2
7	115.057.080	Bracket, Mounting, Bottom Port	2	42	560.011.360	O-Ring	2
	115.176.080	Bracket, Mounting, Top Port	2	43	560.022.360	O-Ring	2
8	115.172.159	Bracket, Mounting, R.H.	1	44	560.033.360	O-Ring	2
9	115.173.159	Bracket, Mounting, L.H.	1	45	560.047.360	O-Ring	2
10	132.002.360	Bumper, Diaphragm	2	46	560.200.360	O-Ring	1
11	135.016.162	Bushing, Threaded, W/ O-Ring 560.001.360	2	47	560.201.360	O-Ring	2
12	165.138.150	Cap, End, Sensor, Hd Est	2	48	560.203.360	O-Ring	2
13	170.024.330	Capscrew, Hex Hd, 7/16-14 X 1	12	49	570.009.360	Pad, Wear	2
14	170.025.330	Capscrew, Hex Head 7/16-14 X 3.00	4		570.009.363	Pad, Wear	2
15	170.030.330	Capscrew, Hex Head 1/2-13 X 2.00	4		570.009.364	Pad, Wear	2
16	170.045.115	Capscrew, Hex Head 5/16-18 X 1 1/4	4		570.009.365	Pad, Wear	2
17	170.060.330	Capscrew, Hex Hd, 7/16-14 X 2.00	12	50	612.047.330	Plate, Diaphragm	2
18	170.125.330	Capscrew, Hex Hd, 5/16-18 X 6	4	51	612.241.147	Plate, Adapter	1
19	171.100.115	Capscrew, Hex Hd, 5/16-18 X 2.50	2	52	612.039.157	Plate, Outer Diaphragm	2
20	196.001.157	Chamber, Inner	2		612.039.010	Plate, Outer Diaphragm	2
21	196.035.156	Chamber, Outer	2		612.097.110	Plate, Outer Diaphragm	2
	196.035.010	Chamber, Outer	2		612.097.112	Plate, Outer Diaphragm	2
	196.035.110	Chamber, Outer	2	53	618.003.330	Plug, Pipe, 1/4	2
	196.035.112	Chamber, Outer	2	54	618.003.330	Plug, Pipe, 1/4	4
22	258.023.147	Cover, Sensor	1		618.003.110	Plug, Pipe, 1/4	4
23	286.007.354	Diaphragm	2	55	620.011.114	Plunger, Actuator	2
	286.007.356	Diaphragm	2	56	675.013.360	Ring, Sealing	2
	286.007.360	Diaphragm	2		675.013.363	Ring, Sealing	2
	286.007.363	Diaphragm	2		675.013.364	Ring, Sealing	2
	286.007.364	Diaphragm	2		675.013.365	Ring, Sealing	2
	286.007.365	Diaphragm	2		675.013.600	Ring, Sealing	2
24	286.020.604	Diaphragm, Overlay	2	57	685.007.120	Rod, Diaphragm	1
25	312.033.156	Elbow, Manifold	2	58	685.032.080	Rod, Connecting	1
	312.033.010	Elbow, Manifold	2	59	720.004.360	Seal, U-Cup	2
	312.033.110	Elbow, Manifold	2	60	722.035.110	Seat, Check Valve (for use with PTFE balls only)	2
	312.033.112	Elbow, Manifold	2		722.035.112	Seat, Check Valve (for use with PTFE balls only)	2
26	312.121.330	Elbow, Pipe, 45deg, 3/4 NPT	1		722.097.110	Seat, Check Valve	2
27	334.025.156	Flange, Threaded	2		722.097.112	Seat, Check Valve	2
	334.025.010	Flange, Threaded	2	61	724.008.000	Sensor, Feed Back	1
	334.025.110	Flange, Threaded	2	62	770.074.159	Spacer	8
	334.025.112	Flange, Threaded	2	63	807.026.330	Stud, 5/8-11 X 2	2
28	334.026.156	Flange, Porting, Suction	1	64	807.038.330	Stud, 3/8-16 X 2.75	4
	334.026.010	Flange, Porting, Suction	1	65	807.039.330	Stud, 1/2-13 X 2.50	12
	334.026.110	Flange, Porting, Suction	1	66	846.001.167	Probe Tip	2
	334.026.112	Flange, Porting, Suction	1	67	894.014.000	Valve, Check	1
29	334.027.156	Flange, Porting, Discharge	1	67a	031.206.000	Cartridge, Check Valve	1
	334.027.010	Flange, Porting, Discharge	1	68	900.003.330	Washer, Lock, 1/2	20
	334.027.110	Flange, Porting, Discharge	1	69	900.004.330	Washer, Lock - 5/16	4
	334.027.112	Flange, Porting, Discharge	1	70	900.005.330	Washer, Lock, 3/8	4
30	360.041.379	Gasket, Pilot Valve	1	71	900.006.330	Washer, Lock, 7/16	12
31	360.048.425	Gasket, Main Air Valve	1	72	901.022.330	Washer, Flat, 7/16	8
32	360.049.425	Gasket, Flange	2	73	902.003.000	Washer, Sealing	2
	360.049.603	Gasket, Flange	2	74	P126-0011	Foam, Sensor, Est	2
33	360.050.379	Gasket, Manifold	4	75	P126-0032	Capscrew, Soc Hd, 8-32 X 7/16	8
	360.050.384	Gasket, Manifold	4	76	475.101.000	Rubber Foot Kit	1
	360.050.608	Gasket, Manifold	4				

Note: The only difference between this and RHDF2 Parts list is the change to item 2, and removing item 68 (920.028.000), bumping up the last 2 parts

Composite Repair Parts Kits

Available Service And Conversion Kits

Air End Kit - 476.247.162

Seals, O-rings, Gaskets, Air Valve Sleeve and Spool Set, and Pilot Valve Assembly

Wet End Kit – 476.245.354 (RHDB2, HDB2)

Santoprene Diaphragms, Balls and EPDM Wear Pads, Sealing Rings, and PTFE Gasket

Wet End Kit – 476.245.360 (RHDB2, HDB2)

Nitrile Diaphragms, Balls, Wear Pads, Gasket, and Sealing Rings

Wet End Kit – 476.245.364 (RHDB2, HDB2)

EPDM Diaphragms, Balls, Wear Pads, and Sealing Ring, and PTFE Gasket

Wet End Kit – 476.245.365 (RHDB2, HDB2)

Neoprene Diaphragms, Balls, Wear Pads Gasket, and Sealing Ring

(Note: All Wetted End Kits listed above contain Fiber Gaskets, and Nitrile O-Rings)

Wet End Kit – 476.245.633 (RHDB2, HDB2)

FKM Diaphragms, Wear Pads, and Sealing Rings, and PTFE Balls, O-Rings, & Gaskets

Wet End Kit – 476.043.635 (RHDB2, HDB2)

Neoprene Diaphragms, and PTFE Overlay Diaphragm, Balls, Sealing Rings, O-Rings, & Gaskets

Wet End Kit – 476.043.663 (RHDB2, HDB2)

Hytrell Diaphragms, and PTFE Overlay Diaphragm, Balls, Sealing Rings, O-Rings, & Gaskets

Sealing Rings Sensor Kit - 476.307.000

(Sensor, Probe Tips and O-rings)

Poppet Valve Kit

(Poppet Valve Assembly, O-ring)

Poppet Valve Assembly Kit

(Poppet Valve Assembly, O-ring, Regulator and Pilot Valve)

Control Module Kit – 476.303.000 (Power Gen AirVantage Only)

(Control Module Assembly, Gaskets, Hardware and O-rings)

Power Gen Kit – 476.293.000 (Power Gen AirVantage Only)

(Power Gen, Gasket, Hardware and O-ring)

Seal Kit – 476.280.000

O-rings and Gaskets

Probe Tip Kit – 476.283.000

(Probe Tips and O-rings)

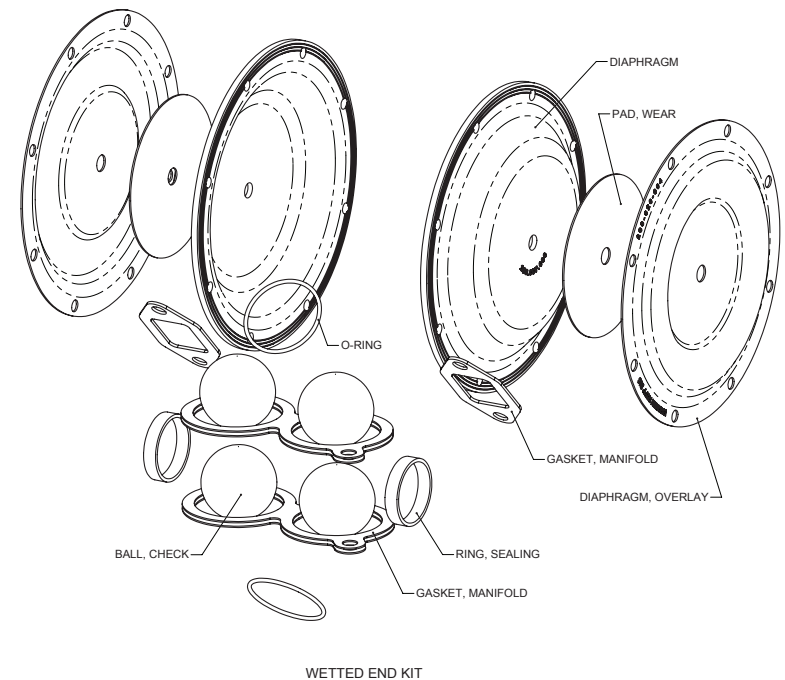
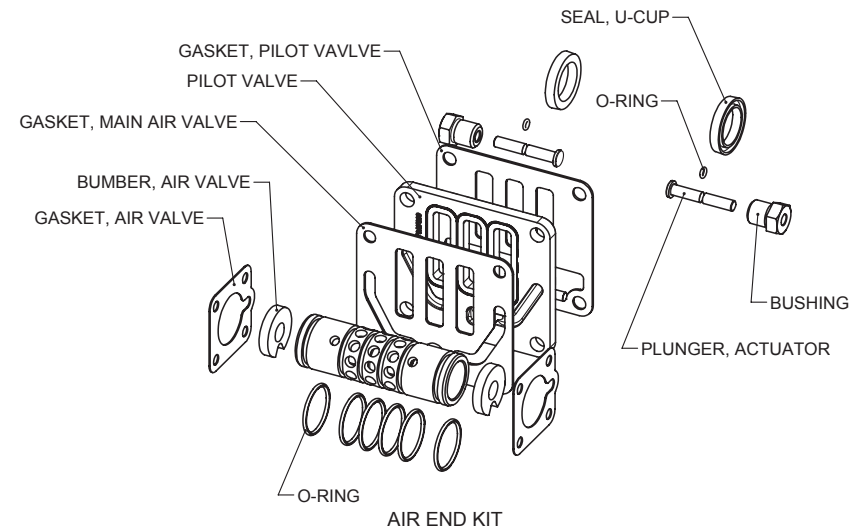
Midsection Upgrade Kit – 475.XXX.000 Consult Factory

(Replaces S20 Metallic Midsection with AirVantage Components)

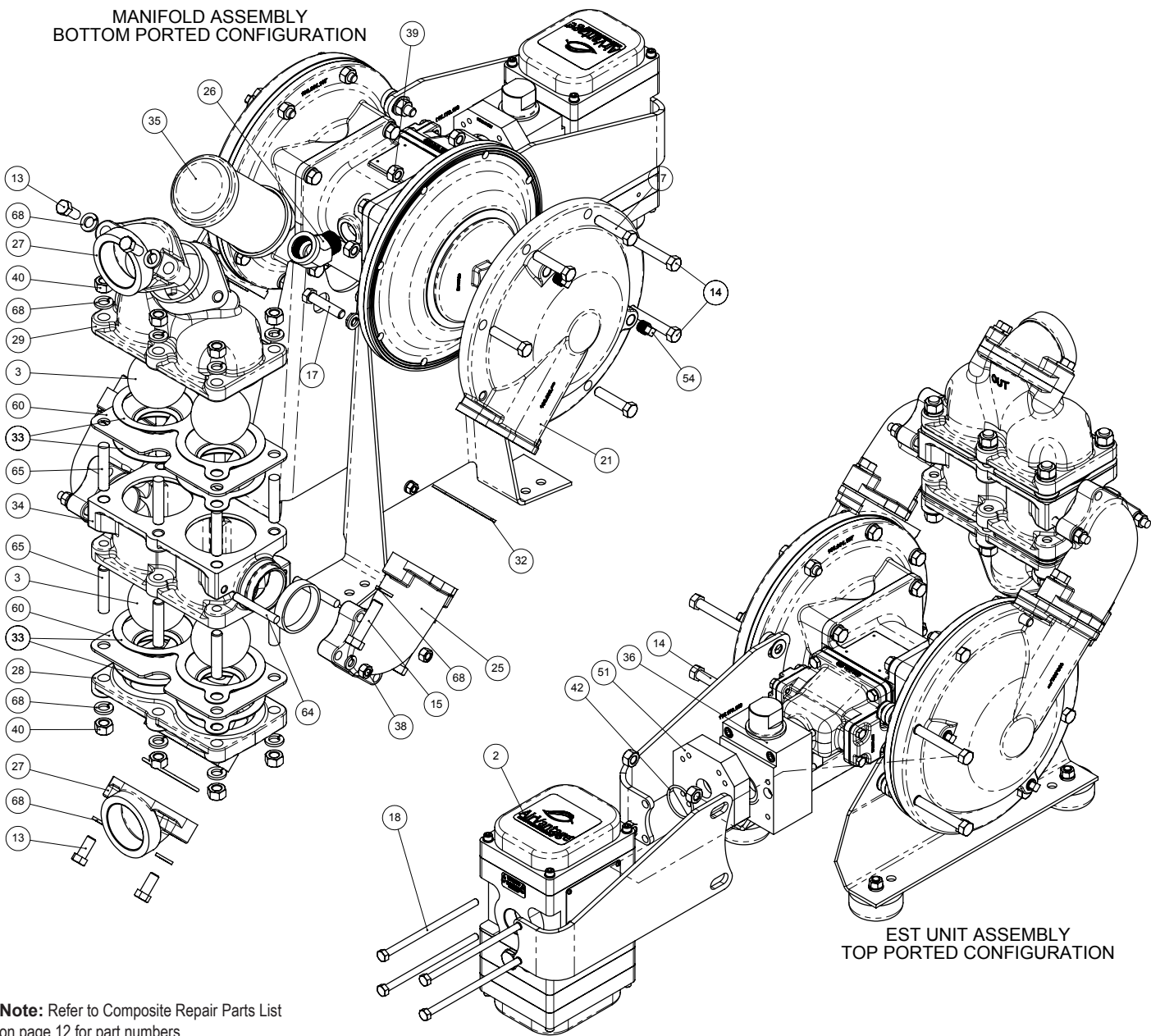
Electronic Leak Detector Kits

032.037.000 100-120/220-240 VAC

032.045.000 12-32 VDC



Composite Repair Parts Drawing: Wetted Side



DIAPHRAGM AND CHECK VALVE SERVICING

- To service the diaphragms, first shut off and bleed the air being supplied to the pump. For safety purposes the air supply line should be disconnected from the pump.
- Then shut off the suction and discharge lines to the pump.
- Bleed the pressure from the pump suction and discharge lines and remove the lines from the pump.
- Drain any remaining liquid from the pump.
- During the servicing of the diaphragms, consult the "Composite Repair Parts Drawing" (p.7).

Step #1: Removing the Manifolds

- Using a 9/16" wrench or socket, remove the 16 cap-screws, hex-nuts, and lockwashers that fasten the manifolds to the outer chambers.
- Remove the manifolds.

Step #2: Inspect Check Valve Components

- Inspect the four check balls for wear, abrasion or cuts on the spherical surface. Also inspect the four check valve seats for cuts, abrasive wear or embedded material around the area where the ball contacts the seat.
- For maximum pump performance and efficiency, the surface of the ball must seal against the seat without any gaps.
- Replace worn or damaged parts as necessary. Consult the "Composite Repair Parts Drawing" for part numbers and quantities.

Step #3: Removing the Outer Chambers

- Using an 11/16" and a 5/8" wrench or socket, remove the 16 cap-screws, and hexnuts that fasten the outer chambers, diaphragms, and inner chambers.

Step #4: Removing the Diaphragm Assemblies

- Once the outer chambers are removed, use a 1-1/16" (27mm) wrench or six-pointed socket to remove the diaphragm assemblies (outer plate, diaphragm, and inner plate) from the diaphragm rod by turning counterclockwise.
- **"AirVantage CAUTION"** – When diaphragm assemblies are removed, watch for the brass probe tips located on the end of the sensor rod. There is one brass probe tip and one o-ring per side. Inspect the probe tips and o-rings for wear. For every diaphragm service, these parts should be replaced and are available in kit form. Consult the "Composite Repair Parts Drawing" for part numbers and quantities.
- The diaphragm connecting rod will usually stay with one of the diaphragm assemblies. Install the rod in a vise fitted with soft jaws and loosen the diaphragm assembly from the rod. Take care not to scar the surface of the rod.
- Insert a 1/4-20 capscrew or set screw into the smaller tapped hole in the inner diaphragm plate.
- Insert the protruding stud and the 1/4-20 fastener loosely into a vise. Use the 1-1/16" wrench or socket to remove the outer diaphragm plate by turning counter-clockwise.

Step #5: Inspect Diaphragms, Diaphragm Connecting Rod, U-cup Seals and Bumpers

- Inspect the diaphragms for cuts and/or punctures in the flexing area. Even the smallest hole or crack can allow product to get to the air side of the pump. If there is product noticed on the air side of the diaphragm, there is a good possibility the diaphragm needs to be replaced.
- **"AirVantage CAUTION"** – If product is observed on the air side of the diaphragm, refer to the "AirVantage Servicing" section of the service manual.
- Abrasive wear of the diaphragm needs to be inspected at the point where the diaphragm contacts the outer chamber or where the diaphragm plates contacts the diaphragm. Chemical attack of a diaphragm will usually result in swelling or deformity. Replace the diaphragms if necessary. Inspect the diaphragm connecting rod for scars, nicks or any imperfection that could cause damage to the u-cup seal. Inspect the u-cup seal for imperfections on the sealing lip. Inspect the bumpers for damage on the face.

Replace components as necessary. Consult the "Composite Repair Parts Drawing" for part numbers and quantities.

Step #6: Assemble the Diaphragms

- Push the threaded stud of the outer diaphragm plate through the center hole of the diaphragm. Thread the inner plate clockwise onto the stud.
- Insert the loose assembly with the above 1/4-20 fastener back into the vise. Use a torque wrench and 1-1/16" socket (27 mm) to tighten the diaphragm assembly together to 480 in.-lbs. (54.23 Newton meters).
- Allow a torqued assembly to set for 15-minutes. This will allow the diaphragm to relax. Re-torque the assembly to compensate for stress relaxation in the clamped assembly.

Step #7: Installing the Diaphragm Assemblies to the Pump

- Make sure the bumper is installed over the diaphragm rod. Thread the stud of the one diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod until the inner diaphragm plate is flush to the end of the rod.
- **"AirVantage CAUTION"** – With the pump lying on one inner chamber, pull the sensor rod UP the full length of its stroke. Insert the brass probe tip and o-ring into the sensor rod. Insert rod and diaphragm assembly into pump, taking care not to damage the u-cup seal. Make sure the diaphragm plate contacts the brass probe tip and stays in contact with it. This will help make sure the probe tip does not fall out during reassembly.
- Align the bolt holes in the diaphragm with the bolt pattern in the inner chamber. Fasten the outer chamber to the pump, using the cap screws, and hex nuts, but do not tighten. Flip the pump over so that it is now setting on the outer chamber. Pull the diaphragm rod out as far as possible. Make sure the bumper is installed over the diaphragm rod.
- **"AirVantage CAUTION"** – Install the second brass probe tip and o-ring on the sensor rod.
- Thread the stud of the remaining diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod (item 34) until the diaphragm plate contacts the end surface of the diaphragm rod. If the bolt holes in the diaphragm do not line up with the inner chamber, use a 1-1/16" (27 mm) socket or wrench to tighten the assembly until they line up.
- Fasten the remaining outer chamber to the pump, using the cap screws and hex nuts, and once again, do not tighten at this point. Tip the pump 90° and set it on a flat surface with the discharge side of the chambers down. This will allow the outer chambers to be aligned with each other. Tighten the sixteen fasteners. Make sure to use a cross tightening pattern to ensure an even sealing on the diaphragm.

Step #8: Re-install the Check Valve Components and Manifolds

- While the pump is setting on the discharge side, insert the check balls and seats on the suction side of the pump. Make sure the seats fit within the counter bore of the chambers. The suction manifold can now be installed, using the eight cap screws, hex nuts and lock washers.
- Flip the pump 180° and install the seats and check balls on the discharge side.
- Now the discharge manifold can be installed and fastened using the remaining cap screws, hex nuts, and lock washers.

OVERLAY DIAPHRAGM SERVICING

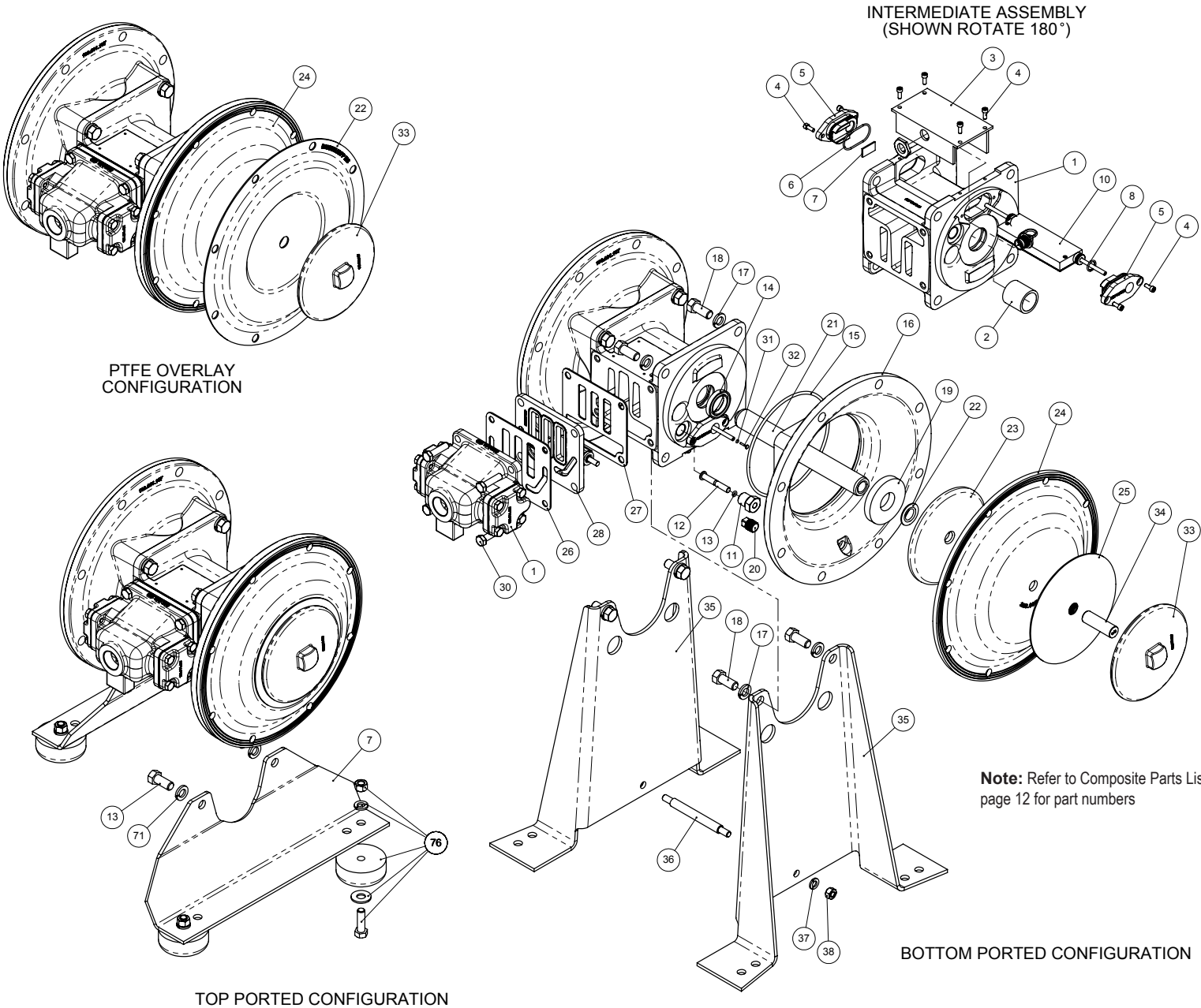
The overlay diaphragm is a PTFE diaphragm that fits over the exterior of the diaphragm. The PTFE diaphragm is used to protect the standard diaphragm from the chemicals being pumped. Repeat step #6 when diaphragms need to be serviced.



! IMPORTANT

Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.

Composite Repair Parts Drawing: Air Side



INTERMEDIATE AND AirVantage SENSOR SERVICING

- To service the intermediate and AirVantage sensor, first shut off and bleed the air being supplied to the pump. For safety purposes, the air supply line should be disconnected from the pump. Shut off both the suction and discharge lines to the pump. Consult the "Composite Repair Parts Drawing".

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can either be removed from the intermediate or from the control module.

Step #2: Remove the AirVantage from the Pump

- Use a ½" socket and remove the four 5/16-18 x 5 ½ cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the plastic cover located on the bottom.

Step #3: Remove the Manifolds, Chambers, and Diaphragms (See Diaphragm Servicing Section)

Step #4: Remove the Diaphragm Assemblies

- Refer to the "Diaphragm Servicing" section of the manual to remove diaphragm assembly from the pump.
- **"AirVantage CAUTION"** – When the diaphragm assembly is removed, watch for the brass probe tips located on the end of the sensor rod. There is one brass probe tip and one o-ring per side. Inspect the probe tips and o-rings for wear. For every diaphragm service, these parts should be replaced and are available in kit form. Consult the "Composite Repair Parts Drawing" for part numbers and quantities.
- **Note:** For AirVantage sensor servicing, refer to page 27.

Step #5: Remove the End Caps

- Use an Allen wrench and remove the two screws from the End Caps on either side of the intermediate.
- Use two small flat-head screw drivers to simultaneously pry the End Caps up at the ends.
- **"AirVantage CAUTION"** – Remove the End Caps from the intermediate with caution, taking care not to damage the sensor. Inspect the gaskets and u-cup seals under each End Cap and replace them as necessary.

Step #6: Accessing the Actuator Plunger Bushings and O-rings

- The actuator plunger pin bushings and o-rings can now be accessed. If it is determined that these parts need to be replaced, use a small screwdriver and remove the retaining rings.
- **NOTE:** It is recommended that new retaining rings be installed after disassembly. The bushing and o-ring can now be removed and inspected.

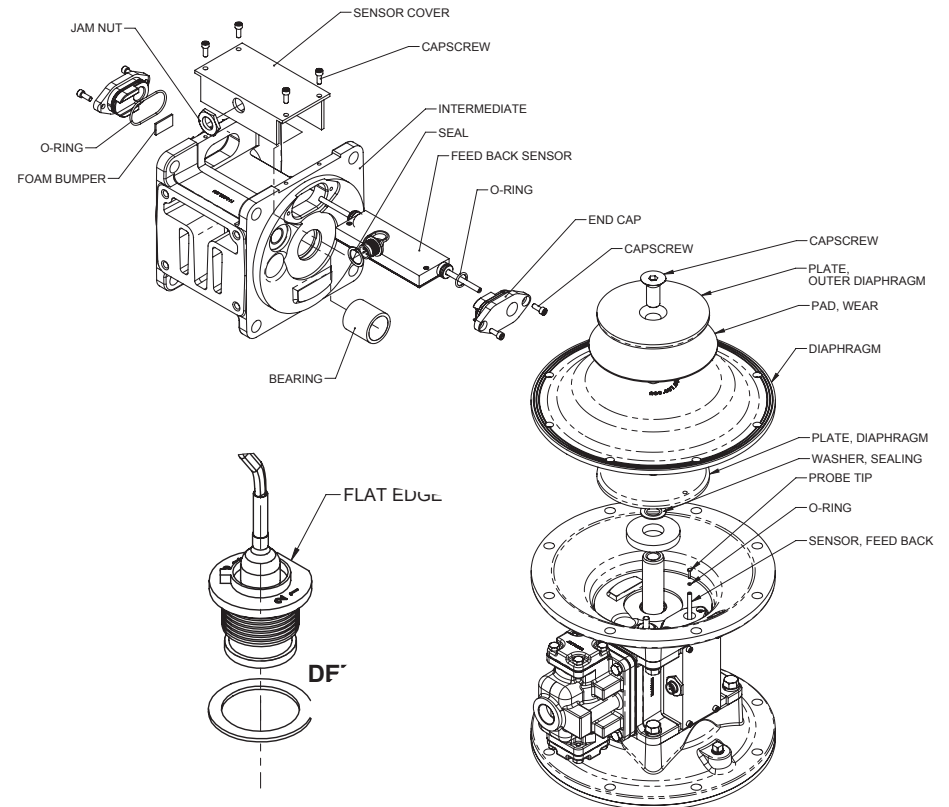
Step #7: Accessing the AirVantage Sensor

- If the sensor needs to be replaced, use a 13/16" socket and remove the plastic nut securing the connector to the intermediate. Slide the connector out of the hole, taking care not to lose/misplace the gasket on the connector.
- The sensor can now be removed from the intermediate assembly.

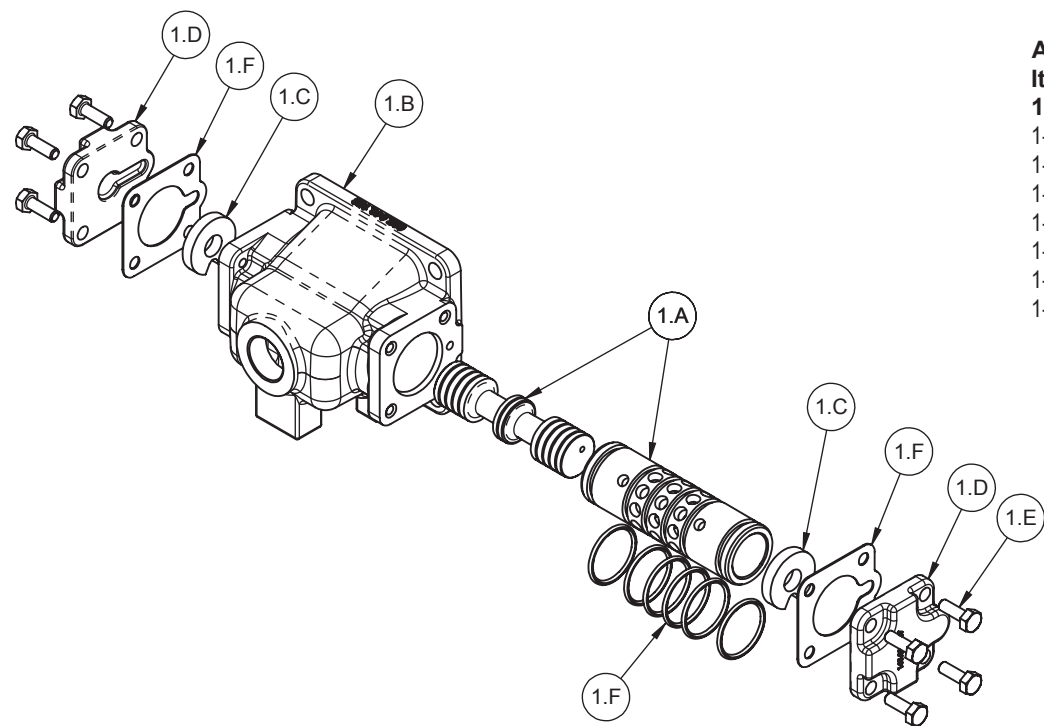
Step#8: Reinstallation

- Slide the new sensor assembly in the intermediate.
- **"AirVantage CAUTION"** – Make sure the cable assembly fits into the groove machined in the intermediate. Failure to do so may damage the cable during assembly.
- Feed the connector through the hole in the intermediate, making sure the gasket is on the connector before installation. The flat edge on the connector should line up with the inside of the intermediate. Install the nut and hand tighten it using a 13/16" socket.
- The inner chambers and gaskets can now be reinstalled. Use blue thread locker on the inner chamber bolts and torque them to 300 in-lbs.
- Refer to the "Diaphragm Servicing" section of the manual to finish the diaphragm installation procedure.

Note: Refer to Composite Repair Parts List on page 12 for part numbers



Air Valve Servicing, Assembly Drawing & Parts List



AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	031-183-003	Air Valve Assembly	1
1-A	031.012.162	Sleeve and Spool Set	1
1-B	095.043.156	Description	1
1-C	132-014.358	Bumper, Air Valve	2
1-D	165.011.157	Cap, End	2
1-E	170.032.330	Capscrew, Hex Head 1/4-20 x 3/4	8
1-F	360.010.427	Body, Air Valve	2
1-F	560.020.360	O-ring	6



! IMPORTANT

Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.

AIR DISTRIBUTION VALVE SERVICING

STEP #1: Remove Air Valve

The main air valve sleeve and spool set is located in the valve body mounted on the pump with four hex head cap-screws. The valve body assembly is removed from the pump by removing these four hex head cap-screws.

STEP #2: Disassembly of the Air Valve

With the valve body assembly off the pump, access to the sleeve and spool set is made by removing four hex head cap-screws (each end) on the end caps of the valve body assembly.

With the end caps removed, slide the spool back and forth in the sleeve. The spool is closely sized to the sleeve and must move freely to allow for proper pump operation. An accumulation of oil, dirt or other contaminants from the pump's air supply, or from a failed diaphragm, may prevent the spool from moving freely. This can cause the spool to stick in a position that prevents the pump from operating. If this is the case, the sleeve and spool set should be removed from the valve body for cleaning and further inspection.

Remove the spool from the sleeve.

Using an arbor press or bench vise (with an improvised mandrel), press the sleeve from the valve body. Take care not to damage the sleeve.

At this point, inspect the o-rings on the sleeve for nicks, tears or abrasions. Damage of this sort could happen during assembly or servicing. A sheared or cut o-ring can allow the pump's compressed air supply to leak or bypass within the air valve assembly, causing the pump to leak compressed air from the pump

air exhaust or not cycle properly. This is most noticeable at pump dead head or high discharge pressure conditions.

Replace any of these o-rings as required or set up a routine, preventive maintenance schedule to do so on a regular basis. This practice should include cleaning the spool and sleeve components with a safety solvent or equivalent, inspecting for signs of wear or damage, and replacing worn components.

Reassembly of the Air Valve

To re-install the sleeve and spool set, lightly lubricate the o-rings on the sleeve with an o-ring assembly lubricant or lightweight oil (such as 10 wt. air line lubricant).

Re-install one end cap, gasket and bumper on the valve body.

Using the arbor press or bench vise that was used in disassembly, carefully press the sleeve back into the valve body, without shearing the o-rings. You may have to clean the surfaces of the valve body where the end caps mount. Material may remain from the old gasket. Old material not cleaned from this area may cause air leakage after reassembly.

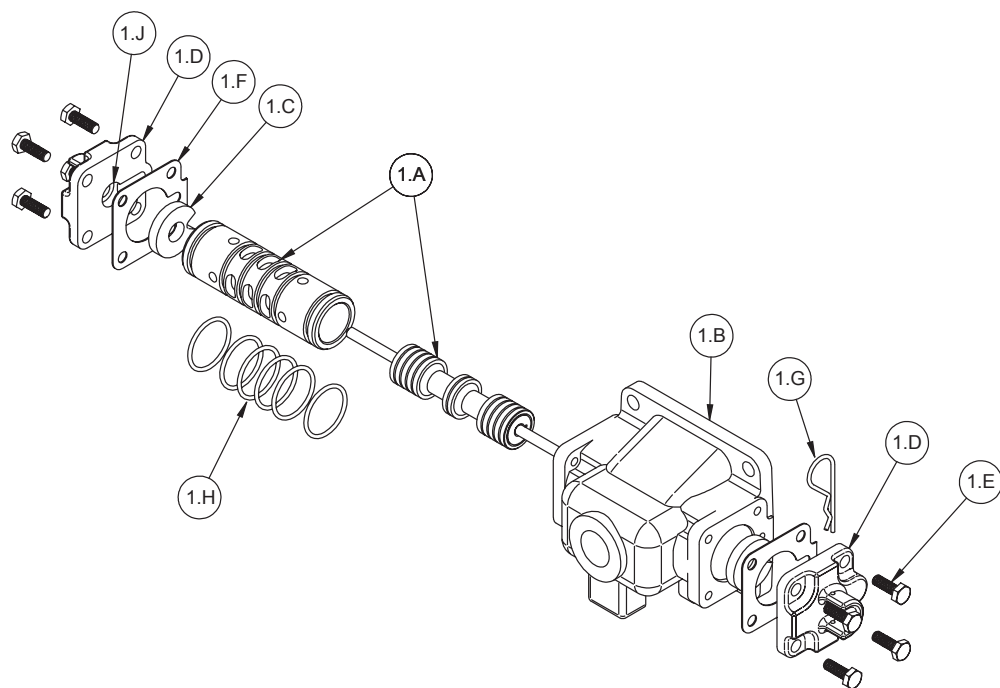
Take care that the bumper stays in place allowing the sleeve to press in all the way.

Reinstall the spool, opposite end cap, gasket and bumper on the valve body.

After inspecting and cleaning the gasket surfaces on the valve body and intermediate, reinstall the valve body on the pump using new gaskets.

Tighten the four hex head cap-screws evenly and in an alternating cross pattern.

Air Valve with Stroke Indicator Assembly Drawing and Parts List



AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	031-147-003	Air Valve Assembly	1
1-A	031-012.162	Sleeve and Spool Set	1
1-B	095-043.156	Description	1
1-C	132-014.358	Bumper, Air Valve	2
1-D	165-065.010	Cap, End	2
1-E	170.032.330	Capscrew, Hex Head 1/4-20 x 3/4	8
1-F	360.010.427	Body, Air Valve	2
1-F	560.020.360	O-Ring	6
1-G	210-008-330	Clip, Safety	1
1-H	560-029-360	O-Ring	2

Air Distribution Valve With Stroke Indicator Option Servicing

To service the air valve first shut off the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump.

Step #1: See COMPOSITE REPAIR PARTS DRAWING.

- Using a 5/16" Allen wrench, remove the four hex socket capscrews and four flat washers. Remove the air valve assembly from the pump.
- Remove and inspect gasket for cracks or damage. Replace gasket if needed.

Step #2: Disassembly of the air valve.

- To access the internal air valve components first remove the two retaining rings from each end of the air valve assembly using clip ring pliers.
- Next remove the two end caps. Inspect the o-ring for cuts or wear. Replace the o-rings if necessary.
- Remove the two bumpers. Inspect the bumpers for cuts, wear or abrasion. Replace if necessary.
- Remove the spool from the sleeve. Be careful not to scratch or damage the outer diameter of the spool. Wipe spool with a soft cloth and inspect for scratches or wear.
- Inspect the inner diameter of the sleeve for dirt, scratches, or other contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set.

Step #3: Reassembly of the air valve.

- Install one bumper and one end cap with o-rings into one end of the air valve body. Install one retaining ring, into the groove on the same end. Insert the safety clip through the smaller unthreaded hole in the endcap.
- Remove the new sleeve and spool set from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings into the six grooves on the sleeve. Apply a light coating of grease to the o-rings before installing the sleeve into the valve body. Align the slots in the sleeve with the slots in the valve body. Insert the spool into the sleeve. Push the spool in until the pin touches the safety clip on the opposite end.
- Install the remaining bumper, end cap with o-rings and retaining ring.
- Fasten the air valve assembly and gasket to the pump.
- Connect the compressed air line to the pump. Remove the safety clip. The pump is now ready for operation.



! IMPORTANT

Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.

Pilot Valve and Actuator Plunger Servicing

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can either be removed from the intermediate or from the control module.

Step #2: Remove the AirVantage from the Pump

- Use a $\frac{1}{2}$ " socket and remove the four 5/16-18 x $5\frac{1}{2}$ cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, carefully set the unit down on the plastic cover located on the bottom.

STEP #3: Remove the Pilot Valve

- Remove the main air distribution valve body from the pump.
- Lift the pilot valve body out of the intermediate housing. (Most problems with the pilot valve can be corrected by replacing the o-rings.)

STEP #4: Dissassemble the Pilot Valve

- Remove the pilot spool and wipe it clean. Inspect the spool and o-rings for dirt, cuts or wear. Replace parts if necessary.
- Use a set of outside snap ring pliers and remove the retaining ring holding the sleeve in the pilot valve body.
- Gently push the sleeve from the body and wipe it clean. Inspect the sleeve and o-rings.
- Replace parts if necessary

STEP #5: Inspect the Actuator Plungers

- Remove the plungers by sliding them out of the bushings. It may be necessary to use a fine piece of wire to pull them out.

STEP #6: Reassemble the Pilot Valve

- Generously lubricate the o-rings on the pilot sleeve with multipurpose grease (BP-LSEP-2 or equivalent).
- Carefully insert the sleeve in the pilot valve body on the chamfered side, taking care not to shear any of the o-rings.
- Securely insert the retaining ring around the sleeve.
- Generously lubricate the o-rings on the pilot spool. Carefully insert the spool in the sleeve.

STEP #7: Reinstall the Pilot Valve

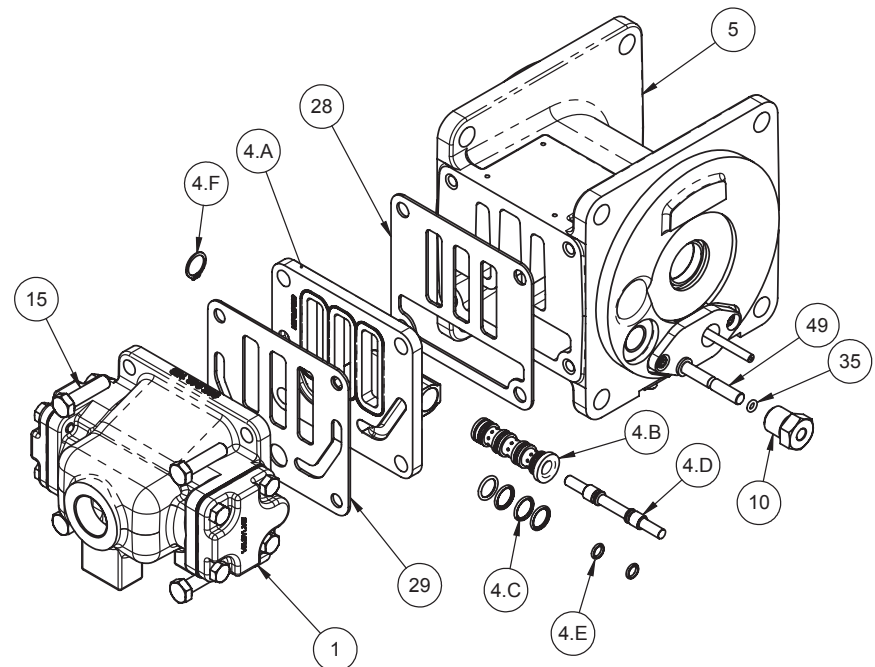
- Push both plungers (located inside the intermediate bracket) out of the path of the pilot valve spool ends to avoid damage.

- If the pilot valve does not fit flush against the gasket, check to make sure the actuator plunger are pushed all the way. Failure to do so may cause damage to the pilot valve or the actuators.
- Insert the pilot valve body onto the intermediate housing.
- Reinstall the main air distribution valve body onto the pump.

Step #8: Reassemble AirVantage and Cable

- Reinstall the AirVantage using the four 5/16-18 x $5\frac{1}{2}$ cap screws and torque to 90 in-lbs.
- Reattach the patch cable connector that connects the AirVantage module to the intermediate.

Item	Part Number	Description	Qty
4.A	095.070.558	BODY, Pilot VALVE	1
4.B	755.025.162	SLEEVE, Pilot VALVE	1
4.C	560.033.360	O-RING	4
4.D	775.026.115	SPOOL, Pilot VALVE	1
4.E	560.023.360	O-RING	2
4.F	675.037.080	RING, RETAINING	1



Note: Refer to Composite Repair Parts List on page 12 for part numbers

Pulse Output Kit Drawing

PULSE OUTPUT KIT OPTION

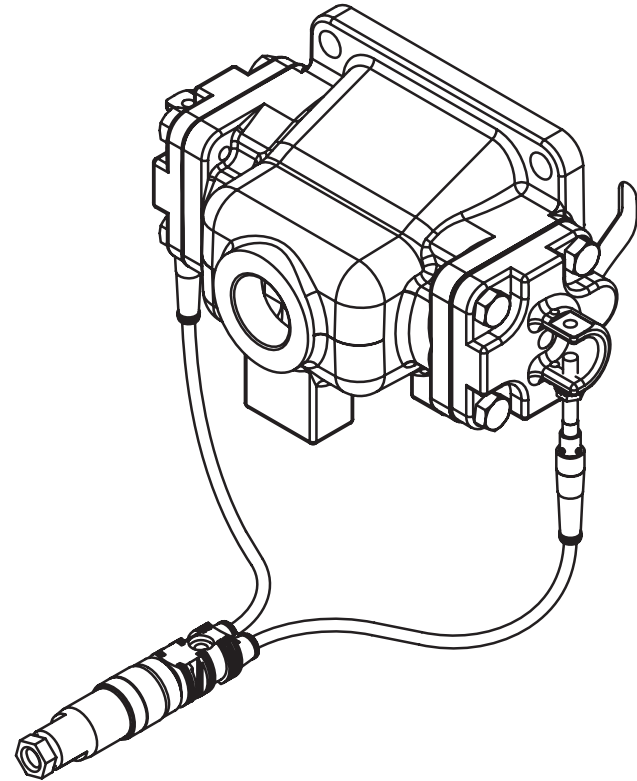
This pump can be fitted with a Pulse Output Kit. This converts the mechanical strokes of the pump to an electrical signal which interfaces with the Stroke Counter/ Batch Controller or user control devices such as a PLC.

The Pulse Output Kits mount directly onto the Muffler Cap on the Air Distribution Valve Assembly or onto the air valve and senses each stroke of the main spool.

Consult the factory for further information and availability.

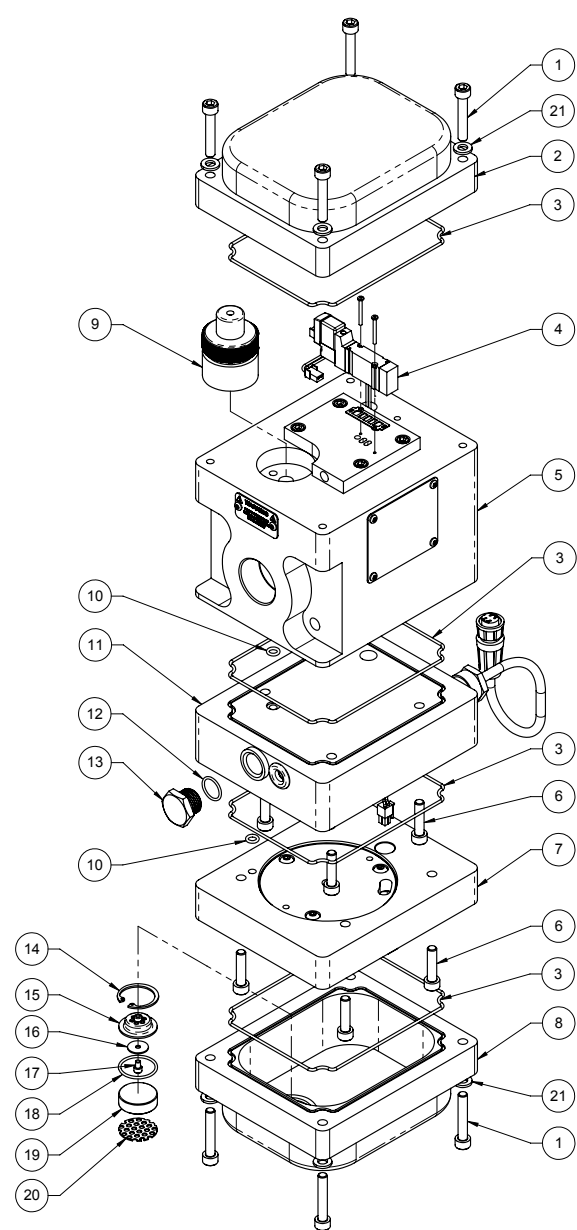
Pulse Output Kits

475-244-001	10-30 VDC
475-244-002	110/220 VAC
475-244-003	10-30VDC, 110VAC and 220 VAC



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Composite Repair Parts Drawing: AirVantage Unit



ITEM No.	PART NUMBER	DESCRIPTION	QTY.
1	171.092.115	CAPSCREW, HEX SOC HD, M6-1.0 x35	8
2	258.020.000	COVER	1
3	720.004.360	SEAL, O-RING	4
4	765.004.000	VALVE, SOLENOID	1
5	893.104.000	VALVE, POPPET	1
6	171.091.115	CAPSCREW, HEX SOC HD, M6-1.0 x25	8
7	031.202.000	POWER GENERATION MODULE	1
8	258.019.000	COVER, END	1
9	020.069.000	REGULATOR	1
10	560.200.360	SEAL, O-RING	2
11	249.028.000	CONTROL MODULE, RHDF2 Hazardous Duty	1
12	560.104.360	SEAL, O-RING	1
13	165.135.330	CAP, SWITCH	1
14	675.067.115	RING, RETAINING	1
15	430.050.147	CAP, DUST	1
16	720.073.365	VALVE, DUST	1
17	171.093.115	CAPSCREW, HEX SOC HD, 5-40 x.25	1
18	560.205.360	SEAL, O-RING	1
19	530.045.115	ARRESTOR, SPARK	1
20	165.137.115	PLATE, PERFORATED	1



AirVantage Servicing - Pilot Valve and Pressure Regulator

Pilot Valve and Pressure Regulator

To service the pilot valve or the pressure regulator, first shut off and bleed the air being supplied to the pump. For safety purposes the air supply line should be disconnected from the pump. Then shut off the suction and discharge lines to the pump. Bleed the pressure from the pump suction and discharge lines and remove the lines from the pump. During the servicing of the AirVantage, consult the "AirVantage Composite Repair Parts Drawing".

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can be removed only from the intermediate.

Step #2: Remove the AirVantage from the Pump

- Use a ½" socket and remove the four 5/16-18 x 5 cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the plastic cover located on the bottom. Inspect the o-ring between the poppet valve and the adapter plate for damage.

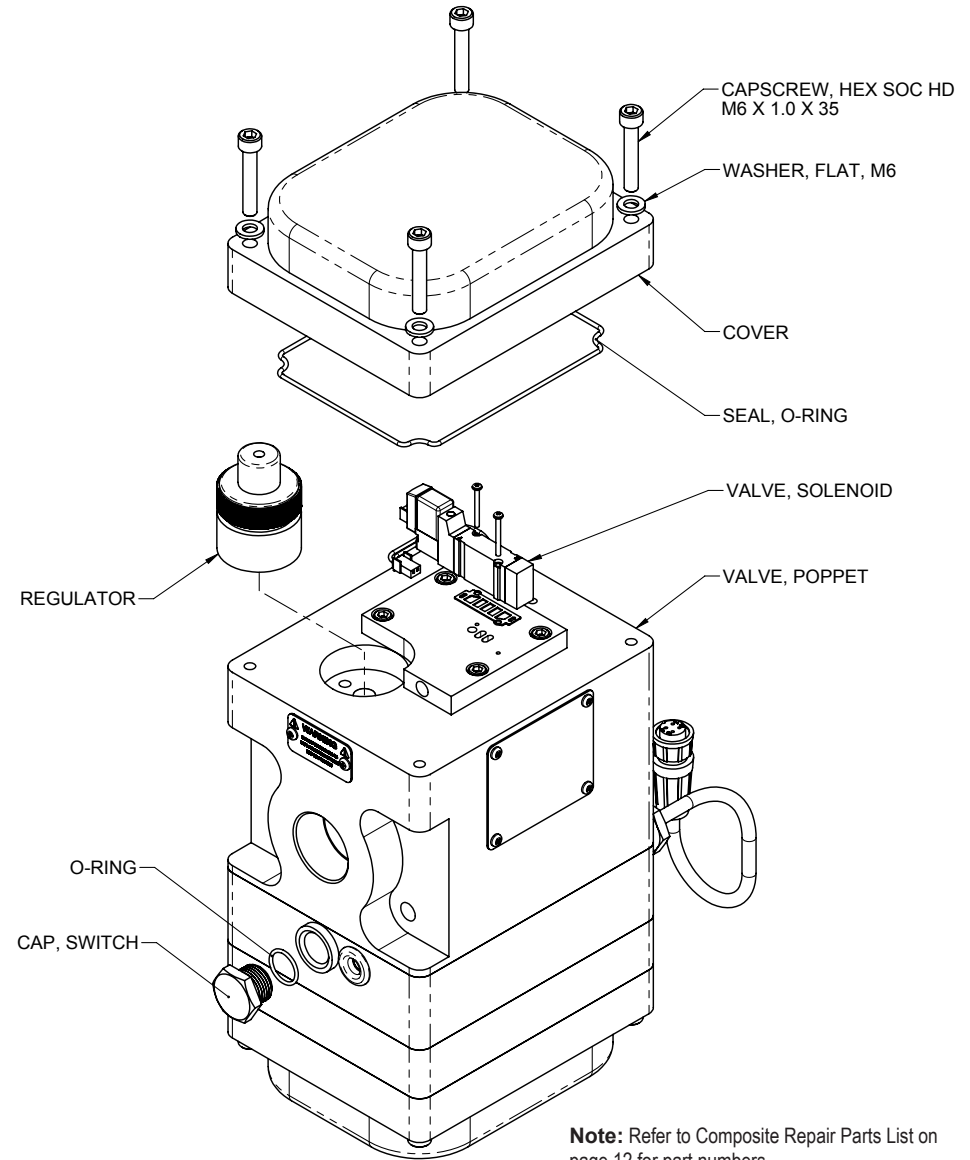
Step #3: Access the Pilot Valve and Pressure Regulator

- Use a 5mm hex-key wrench and remove four M6 x 35mm socket head cap screws & washers securing the top cover on. Lift the cover off, exposing the pilot valve and pressure regulator. There is a molded o-ring seal located on the underside of the cap. Make sure the o-ring stays located within the groove.
- If the pilot valve needs to be replaced, unplug the connector attached to it. Use a miniature 4-way Phillips screwdriver and remove the two screws holding the pilot valve to the plate. The valve and gasket can now be removed and/replaced. When reinstalling the pilot valve, tighten the screws to snug with a miniature 4-way Phillips screwdriver.
- "AirVantage CAUTION"** – Be sure to reattach the connector to the pilot valve.
- If the pressure regulator needs to be replaced, use slip-joint pliers to unscrew the regulator from the body by turning it in a counterclockwise direction.
- "AirVantage CAUTION"** – Do not loosen or tighten the regulator by turning the knurled portion of the unit. Place the slip-joint pliers on the smooth area underneath the knurled area of the regulator.

Step #4: Reinstallation

- Reinstall the top cover, making sure the o-ring seal is still in the groove. Tighten the four M6 screws.
- Reinstall the AirVantage using the four 5/16-18 x 5 cap screws and torque to 90 in-lbs.
- "AirVantage CAUTION"** – Be sure to reattach the patch cable connector that connects the AirVantage module to the intermediate.

Note: Ensure all mating faces are free from scores or damage prior to re-assembly. Check each metallic face joint with a 0.003" feeler gage to ensure all flange faces are fully closed after assembly. Failure to do so may compromise the flameproof design of the assembly.



AirVantage Servicing - Power Generation Module

To service the power generation module, first shut off and bleed the air being supplied to the pump. For safety purposes the air supply line should be disconnected from the pump. Then shut off the suction and discharge lines to the pump. Bleed the pressure from the pump suction and discharge lines and remove the lines from the pump. During the servicing of the AirVantage, consult the "AirVantage Composite Repair Parts Drawing".

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can be removed only from the intermediate.

Step #2: Remove the AirVantage from the Pump

- Use a 1/2" socket and remove the four 5/16-18 x 5 cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the plastic cover located on the top of the unit. Inspect the o-ring between the poppet valve and the adapter plate for damage.

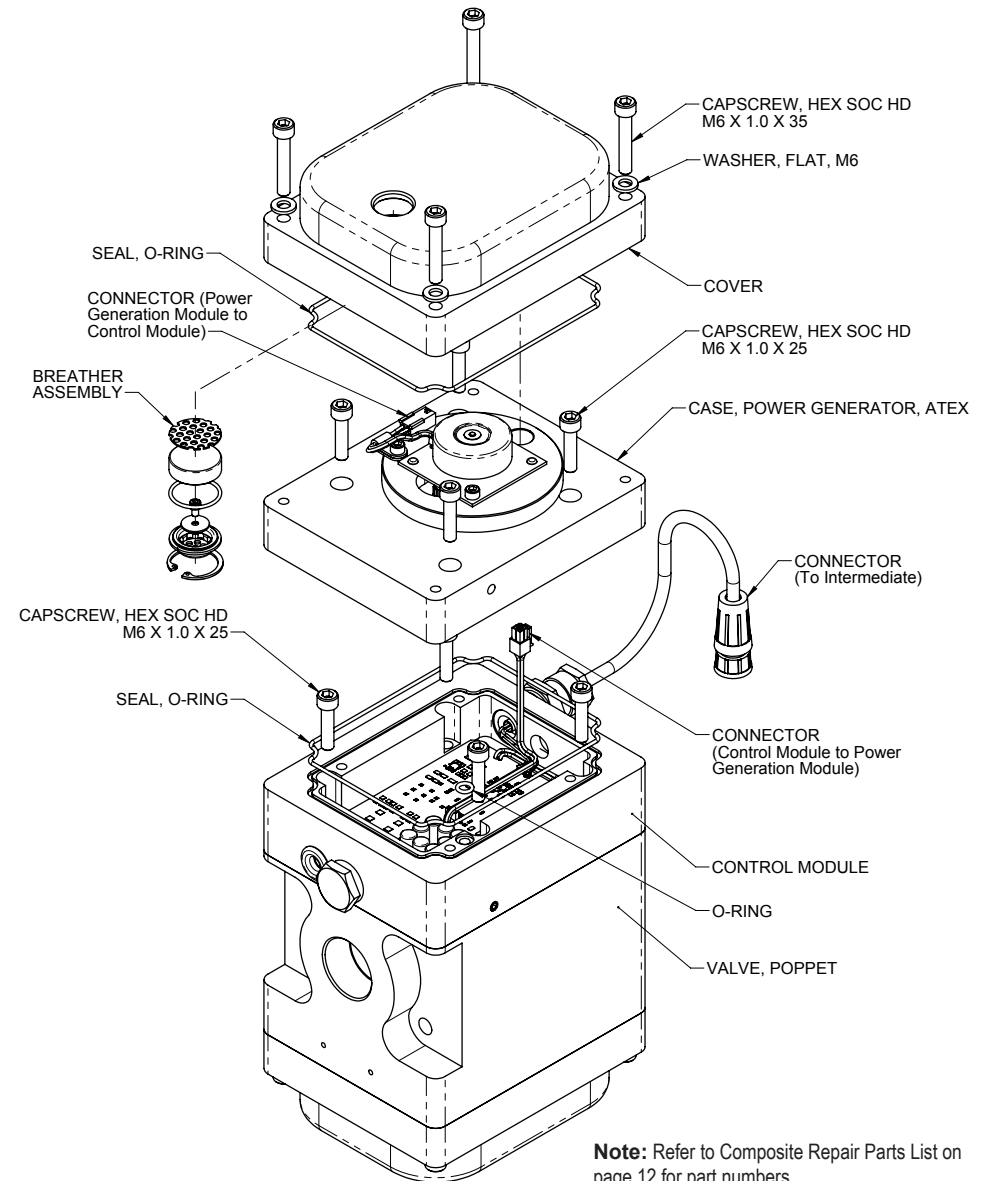
Step #3: Access the Power Generation Module

- Use a 5mm hex-key wrench and remove four M6 x 35mm socket head cap screws & washers securing the bottom cover. Lift the bottom cover off, exposing the power generation module. There is a molded o-ring seal located on the underside of the cap. Make sure the o-ring stays located within the groove.
- If the power generation module needs to be replaced, unplug the connector that connects the power generator to the control board. Use a 5mm hex-key wrench and remove four M6 x 25mm socket head cap screws. The power generation module should now be loose. Carefully lift the power generation module off the rest of the assembly, making sure that the control board wire and connector slips through the hole in the power generation case.
- "AirVantage CAUTION"** - Take caution not to loosen the o-ring that seals between the components.

Step #4: Reinstallation

- When reinstalling the new module make sure to feed the control module wire through the hole in the power generation case. Install the four M6 x 25mm socket head cap screws and tighten to 6.8 N-M.
- "AirVantage CAUTION"** – Be sure to reattach the connector from the power generator to the control board.
- Reinstall the bottom cover, making sure the o-ring seal is still in the groove. Tighten the four M6 x 35 socket head cap screws to 3.4 N-M.
- Reinstall the top cover, making sure the o-ring seal is still in the groove. Tighten the four M6 screws. Reinstall the AirVantage using the four 5/16-18 x 5 cap screws and torque to 90 in-lbs.
- "AirVantage CAUTION"** – Be sure to reattach the patch cable connector that connects the AirVantage module to the intermediate.

Note: Ensure all mating faces are free from scores or damage prior to re-assembly. Check each metallic face joint with a 0.003" feeler gage to ensure all flange faces are fully closed after assembly. Failure to do so may compromise the flameproof design of the assembly.



Note: Refer to Composite Repair Parts List on page 12 for part numbers



AirVantage Servicing - Control Module

To service the control module, first shut off and bleed the air being supplied to the pump. For safety purposes the air supply line should be disconnected from the pump. Then shut off the suction and discharge lines to the pump. Bleed the pressure from the pump suction and discharge lines and remove the lines from the pump. During the servicing of the AirVantage, consult the "AirVantage Composite Repair Parts Drawing".

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can be removed only from the intermediate.

Step #2: Remove the AirVantage from the Pump

- Use a ½" socket and remove the four 5/16-18 x 5 cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the plastic cover located on the bottom. Inspect the o-ring between the poppet valve and the adapter plate for damage.

Step #3: Access the Pilot Valve

- Use a 5mm hex-key wrench and remove four M6 x 35mm socket head cap screws & washers securing the top cover on. Lift the cover off, exposing the pilot valve. There is a molded o-ring seal located on the underside of the cap. Make sure the o-ring stays located within the groove. The connector will need to be removed from the pilot valve. Once the plug has been removed, feed the wire assembly into the hole in the valve body to the point where the connector just enters the valve body. Reinstall the top cover and loosely reinstall the bolts. The connector will eventually need to be reconnected.

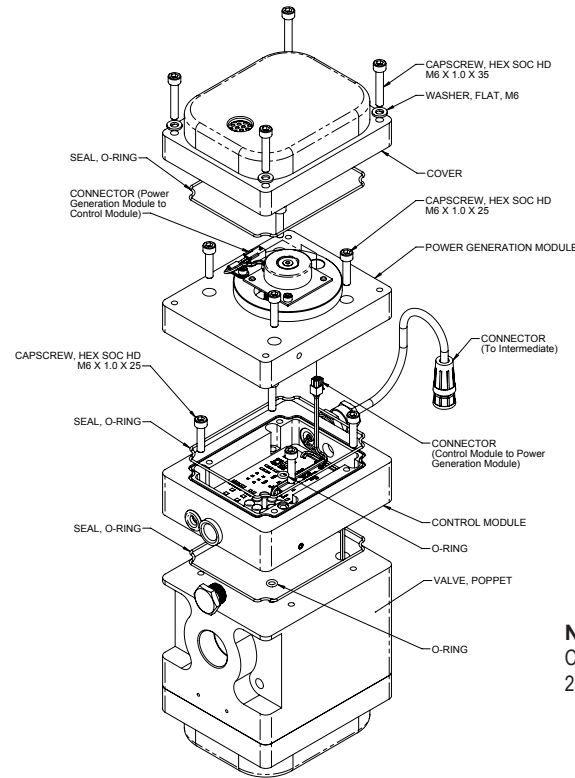
Step #4: Access the Control Module

- Use a 5mm hex-key wrench and remove four M6 x 35mm socket head cap screws & washers securing the bottom cover on. Lift the bottom cover off, exposing the power generation module. There is a molded o-ring seal located on the underside of the cap. Make sure the o-ring stays located within the groove.
- Unplug the connector that connects the power generator to the control board. Use a 5mm hex-key wrench to loosen the four M6 x 25mm socket head cap screws. The power generation module should now be loose. Carefully lift the power generation module off the rest of the assembly, making sure that the control board wire and connector slips through the hole in the power generation case.
- "AirVantage CAUTION" - Take caution not to lose the o-ring that seals between the components.**
- If the control module needs to be replaced, use a 5mm hex-key wrench to loosen the four M6 x 25mm socket head cap screws holding the control module to the poppet assembly. The control module should now be loose. Carefully lift the control module off the poppet assembly, making sure that the pilot valve connector wire slips through the hole in the poppet valve assembly.
- "AirVantage CAUTION" - Take caution not to loosen the o-ring that seals between the components.**

Note: Ensure all mating faces are free from scores or damage prior to re-assembly. Check each metallic face joint with a 0.003" feeler gage to ensure all flange faces are fully closed after assembly. Failure to do so may compromise the flameproof design of the assembly.

Step #5: Reinstalling

- When reinstalling the new control module, make sure to feed the pilot valve connector wire through the hole in the poppet valve assembly. Install the four M6 x 25mm socket head cap screws and tighten to 3.4 N-M.
- Reinstall the power generation module. Make sure to feed the control module wire through the hole in the power generation case. Install the four M6 x 25mm socket head cap screws and tighten to 6.8 N-M.
- "AirVantage CAUTION" – Be sure to reattach the connector from the power generator to the control board.**
- Reinstall the top cover, making sure the o-ring seal is still in the groove. Tighten the four M6 screws. Reinstall the AirVantage using the four 5/16-18 x 5 cap screws and torque to 90 in-lbs.
- "AirVantage CAUTION" – Be sure to reattach the patch cable connector that connects the AirVantage module to the intermediate.**



Note: Refer to AirVantage Composite Repair Parts List on page 23 for part numbers



AirVantage Servicing - Sensor Assembly

To service the control module, first shut off and bleed the air being supplied to the pump. For safety purposes the air supply line should be disconnected from the pump. Then shut off the suction and discharge lines to the pump. Bleed the pressure from the pump suction and discharge lines and remove the lines from the pump. During the servicing of the AirVantage, consult the "AirVantage Composite Repair Parts Drawing".

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can either be removed from the intermediate or from the control module.

Step #2: Remove the AirVantage from the Pump

- Use a 1/2" socket and remove the four 5/16-18 x 5 cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the plastic cover located on the bottom. Inspect the o-ring between the poppet valve and the adapter plate for damage.

Step #3: Diaphragm Disassembly

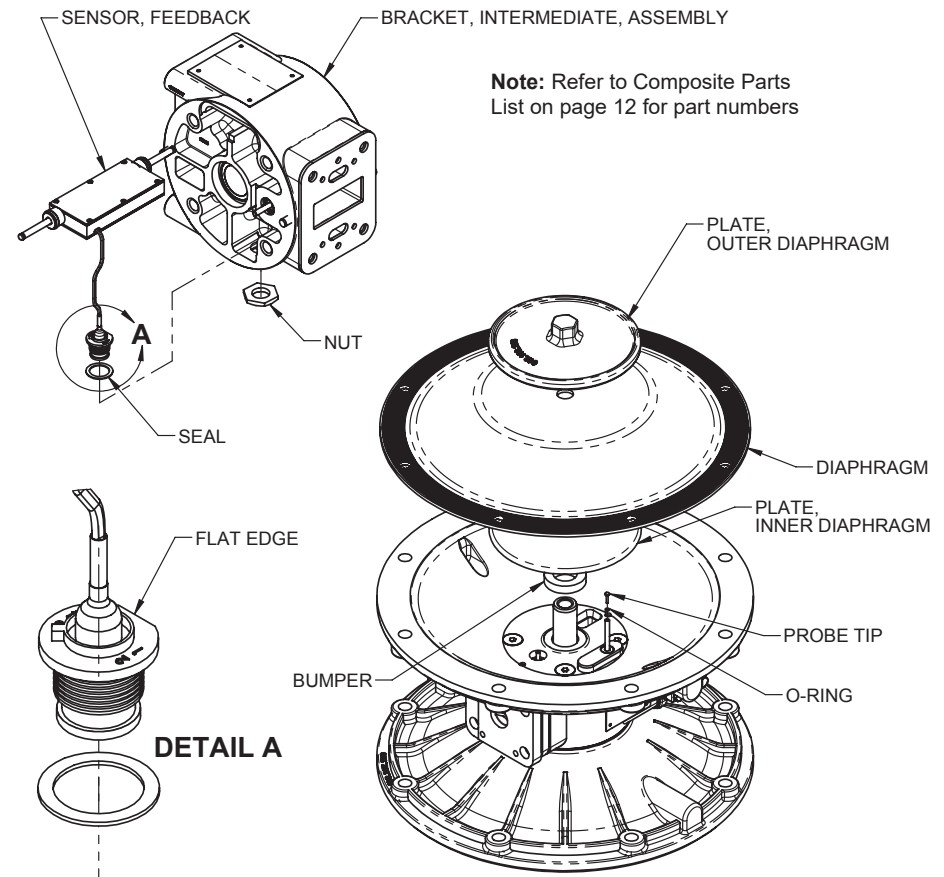
- Refer to the "Diaphragm Servicing" section (p.15) of the manual to remove diaphragm assembly from the pump.
- "AirVantage CAUTION"** – When the diaphragm assembly is removed, watch for the brass probe tips located on the end of the sensor rod. There is one brass probe tip and one o-ring per side. Inspect the probe tips and o-rings for wear. For every diaphragm service, these parts should be replaced and are available in kit form. Consult the "Composite Repair Parts Drawing" for part numbers and quantities.

Step #4: Accessing the Sensor Assembly

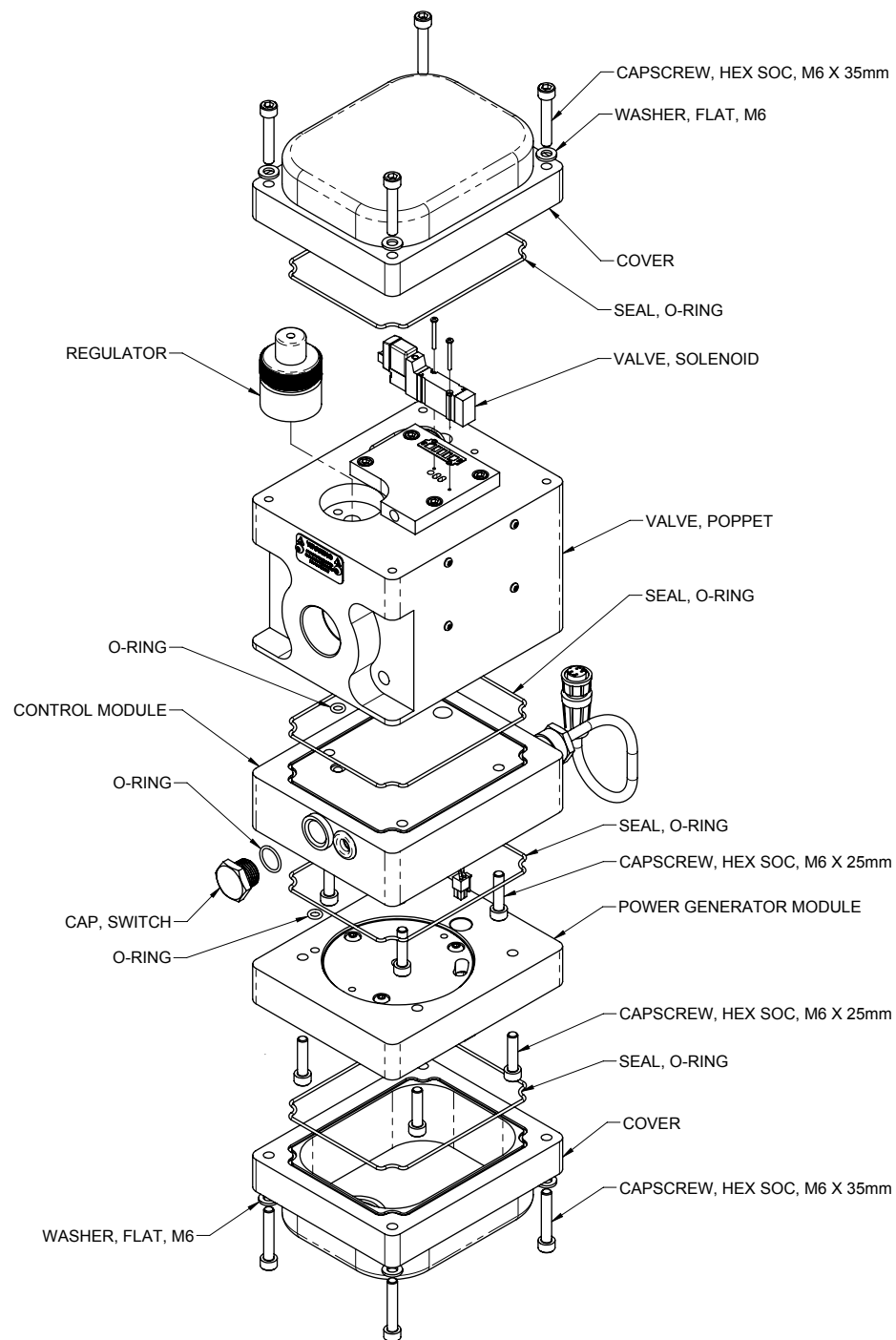
- Use a 1/4" hex key wrench and remove the four, flat head socket cap screws on each inner chamber. These bolts have been assembled using blue thread locker, so they may be difficult to remove. The inner chambers and gaskets can now be removed.
- "AirVantage CAUTION"** – Remove the inner chamber from the intermediate with caution, taking care not to damage the sensor.
- If the sensor needs to be replaced, use a 13/16" socket and remove the plastic nut holding the connector to the intermediate. Slide the connector out of the hole.
- The sensor can now be removed from the intermediate assembly.

Step #5: Reinstallation

- Slide the new sensor assembly in the intermediate.
- "AirVantage CAUTION"** – Make sure the cable assembly fits into the groove machined in the intermediate. Failure to do so may damage the cable during assembly.
- Feed the connector through the hole in the intermediate and install the plastic nut. Hand tighten the nut using a 13/16" socket. Make sure the gasket is to the inside of the intermediate.
- The inner chambers and gaskets can now be reinstalled. Use blue thread locker on the inner chamber bolts and torque them to 300 in-lbs.
- Refer to the "Diaphragm Servicing" section of the manual to finish the diaphragm installation procedure.



AirVantage Servicing - Poppet Valve Drawing



Note: Refer to AirVantage Composite Repair Parts
List on page 23 for part numbers

AirVantage Servicing - Poppet Valve

Step #1: Remove the Patch Cable

- Twist the ribbed portion of the patch cable connector in a counterclockwise direction, until it unthreads from the connector. The cable can either be removed from the intermediate or from the control module.

Step #2: Remove the AirVantage from the Pump

- Use a ½" socket and remove the four 5/16-18 x 5 ½ cap screws that hold the AirVantage to the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the bottom cover. Inspect the o-ring between the poppet valve and the adapter plate for damage.

Step #3: Access the Solenoid Valve and Pressure Regulator

- Use a 5/32 hex-key wrench and loosen the four 10-32 x .50 socket head cap screws securing the top cover on. Lift the cover off, exposing the solenoid valve and pressure regulator. There is a molded o-ring seal located on the underside of the cap. Make sure the o-ring stays located within the groove.
- Unplug the connector attached to it. Use a miniature 4-way Phillips screwdriver and remove the two screws securing the solenoid valve to the plate. The valve and gasket can now be removed and/or replaced.
- Use slip-joint pliers to unscrew the regulator from the body by turning it in a counterclockwise direction.
- **"AirVantage CAUTION" – Do not loosen or tighten the regulator by turning the knurled portion of the unit. Place the slip-joint pliers on the smooth area underneath the knurled area of the regulator. Reinstall the top cover and loosely reinstall the bolts.**

Step #4: Access the Power Generation Module

- Turn the assembly over and let it now rest on the top cover.
- Use a 5/32 hex-key wrench and remove the four 10-32 x .50 socket head cap screws securing the bottom cover on. Lift the bottom cover off, exposing the power generation module. There is a molded o-ring seal located on the underside of the cap. Make sure the o-ring stays located within the groove.
- Unplug the connector that connects the power generator to the control board. Use a 5/32 hex-key wrench to loosen the four 10-32 x 2 ¼ socket head cap screws. The power generation module should now be loose. Carefully lift the power generation module off the rest of the assembly, making sure that the control board wire and connector slips through the hole in the power generation case.

Step #5: Access the Control Module

- Use a 5/32 hex-key wrench and loosen the two 10-32 x 1.00 socket head cap screws securing the control module to the poppet assembly. The control module should now be loose. Carefully lift the control module off the poppet assembly, making sure that the solenoid valve connector wire slips through the hole in the poppet valve assembly.
- The Poppet valve assembly can now be replaced.

Step #6: Reinstallation

- Install the control module on the poppet valve assembly. Make sure to feed the solenoid valve connector wire through the hole in the poppet valve assembly. Install the two 10-32 x 1.00 socket head cap screws and tighten to 30 in-lbs.
- Install the power generation module onto the control module. Make sure to feed the control module wire through the hole in the power generation case. Install the four 10-32 x 2 ¼ socket head cap screws and tighten to 60 in-lbs.
- **"AirVantage CAUTION" – Be sure to reattach the connector from the power generator to the control board.**
- Install the bottom cover, making sure the o-ring seal is still in the groove. Tighten the four 10-32 screws. The unit can now be turned over and set on the bottom cover.
- Install the solenoid valve, tighten the screws snug with a miniature 4-way Phillips screwdriver.
- **"AirVantage CAUTION" – Be sure to reattach the connector to the solenoid valve.**
- **"AirVantage CAUTION" – Be sure to reattach the patch cable connector that connects the AirVantage module to the intermediate.**
- If the pressure regulator needs to be replaced, use slip-joint pliers to unscrew the regulator from the body by turning it in a counterclockwise direction.
- **"AirVantage CAUTION" – Do not loosen or tighten the regulator by turning the knurled portion of the unit. Place the slip-joint pliers on the smooth area underneath the knurled area of the regulator.**

Step #7: Reinstallation

- Reinstall the top cover, making sure the o-ring seal is still in the groove. Tighten the four 10-32 screws.
- Reinstall the AirVantage using the four 5/16-18 x 5 ½ cap screws and torque to 90 in-lbs.
- **"AirVantage CAUTION" – Be sure to reattach the patch cable connector that connects the AirVantage module to the intermediate.**
- **Refer to Page 28 for Illustration**

Note: Ensure all mating faces are free from scores or damage prior to re-assembly. Check each metallic face joint with a 0.003" feeler gage to ensure all flange faces are fully closed after assembly. Failure to do so may compromise the flameproof design of the assembly.



AirVantage Servicing - Check Valve

AirVantage - Check Valve Assembly

To service the check valve, first shut off and bleed the air being supplied to the pump. For safety purposes the air supply line should be disconnected from the pump. Then shut off the suction and discharge lines to the pump. Bleed the pressure from the pump suction and discharge lines and remove the lines from the pump. During the servicing of the AirVantage, consult the "AirVantage Composite Repair Parts Drawing" (Page 11)

Step #1: Remove the Patch Cable

Twist the ribbed portion of the patch cable connector in the counterclockwise direction, until it un-threads from the connector. The cable can be either be removed from the intermediate or from the control module.

Step #2: Remove the AirVantage from the Pump

Use a ½" socket and remove the four 5/16 x 5 ½ cap screws that hold the AirVantage to the pump. Remove the two chamber bolts/nuts that are holding the right side bracket to be able to remove the right bracket and the AirVantage unit from the pump. Be sure to support the weight of the AirVantage while removing the last cap screw. After the AirVantage is removed from the pump, set the unit down on the plastic cover located on the bottom. Inspect the o-ring between the poppet valve and adapter plate for damage.

Step 3: Remove the Check Valve from the Pump

Use a ½" socket and remove the four 5/16 x 2 ½ cap screw that holds the check valve to the pump.

Step 4: Inspect Check Valve

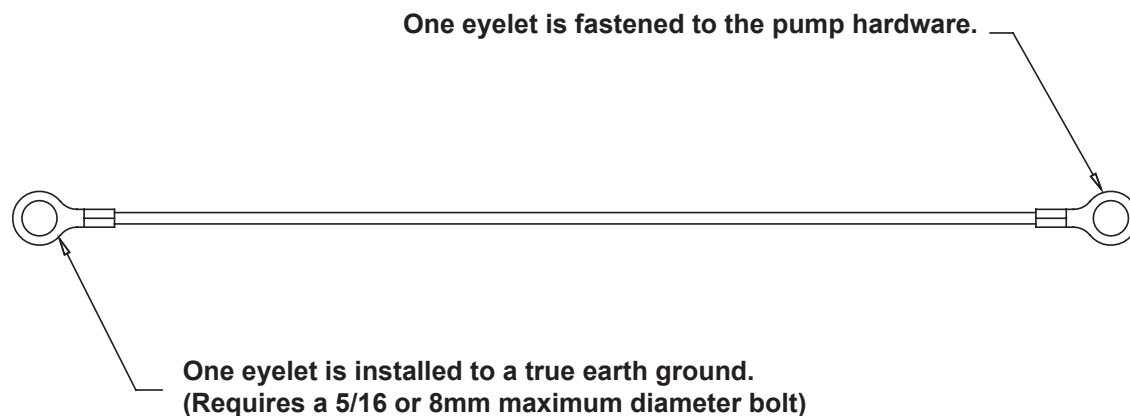
Using a 1 ¼" open socket wrench, remove the cartridge valve. Inspect o-rings and mechanism for any signs of wear, degradation, or damage. If any is present, replace with new cartridge valve assembly. Remove any remaining fluid contamination on inside of body and/or cartridge valve. Be careful not to lose the large and small o-rings on either face of the check valve body.

Step 5: Re-assembly of Check Valve

Apply a thin layer of white lithium grease to the threads on the valve cartridge. Insert cartridge valve into body and hand-tighten being careful not to pinch o-ring. Using a 9" torque wrench with crow-foot, torque cartridge valve to 250 in-lbs. Re-apply o-rings, as necessary, to both faces of check valve. After applying Blue Loctite 248, 222 (or equivalent) secure check valve back to pump with four 5/16 x 2 ½ cap screws, re-torque to 90 in-lbs.

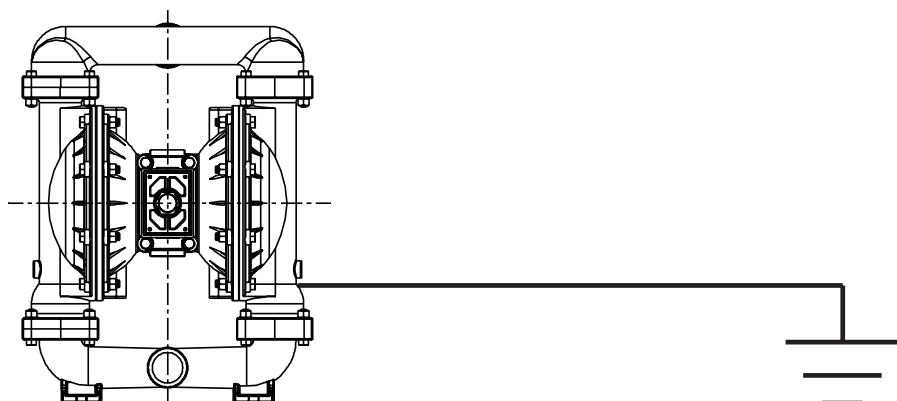
To secure the AirVantage, re-install the four 5/16 x 5 ½ cap screws, torquing to 90 in-lbs. Re-install Patchcable.

Grounding The Pump



This 8-foot long (244 centimeters) Ground Strap, part number 920-025-000, can be ordered as a service item.

To reduce the risk of static electrical sparking, this pump must be grounded. Check the local electrical code for detailed grounding instruction and the type of equipment required.



	! WARNING
	<i>Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded.</i>

PUMPING HAZARDOUS LIQUIDS

- When a diaphragm fails, the pumped liquid or fumes enter the air end of the pump. Fumes are exhausted into the surrounding environment. When pumping hazardous or toxic materials, the exhaust air must be piped to an appropriate area for safe disposal. See illustration #1 at right.
- Piping used for the air exhaust must not be smaller than 1" (2.54 cm) diameter. Reducing the pipe size will restrict air flow and reduce pump performance. When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills. See illustration #2 at right.

CONVERTING THE PUMP FOR PIPING THE EXHAUST AIR

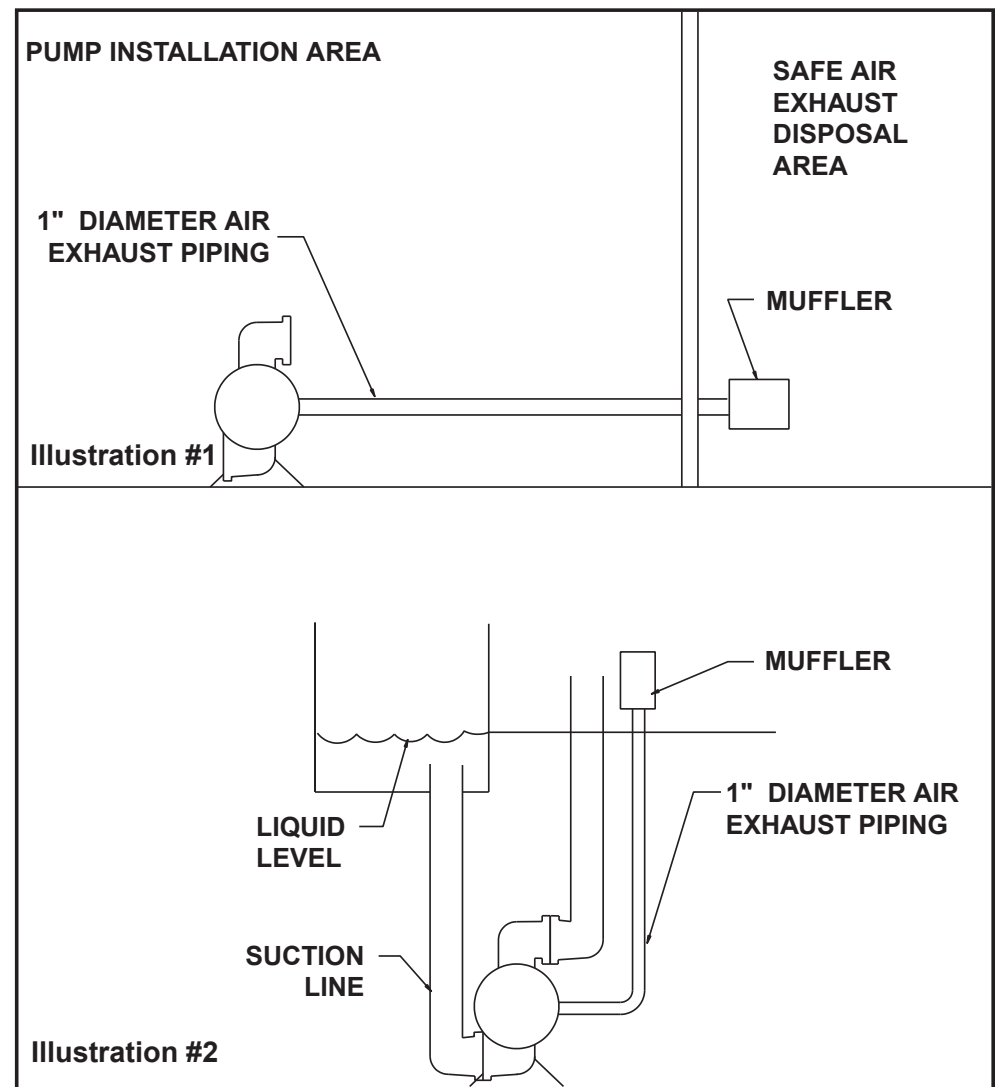
- The following steps are necessary to convert the pump to pipe the exhaust air away from the pump.
- Remove the muffler. The air distribution valve has 1" NPT threads for piped exhaust.

IMPORTANT INSTALLATION NOTE:

- The manufacturer recommends installing a flexible conductive hose or connection between the pump and any rigid plumbing. This reduces stresses on the molded threads of the air exhaust port. Failure to do so may result in damage to the air distribution valve body.
- Failure to support these connections could also result in damage to the air distribution valve body.



CONVERTED EXHAUST ILLUSTRATION



Material Codes

The Last 3 Digits of Part Number

000	Assembly, sub-assembly; and some purchased items	175	Die Cast Zinc	375	Fluorinated Nitrile	603	Blue Gylon
010	Cast Iron	180	Copper Alloy	378	High Density Polypropylene	604	PTFE
012	Powered Metal	305	Carbon Steel, Black Epoxy Coated	379	Conductive Nitrile	606	PTFE
015	Ductile Iron	306	Carbon Steel, Black PTFE Coated	405	Cellulose Fiber	607	Envelon
020	Ferritic Malleable Iron	307	Aluminum, Black Epoxy Coated	408	Cork and Neoprene	608	Conductive PTFE
025	Music Wire	308	Stainless Steel, Black PTFE Coated	425	Compressed Fiber	610	PTFE Integral Silicon
080	Carbon Steel, AISI B-1112	309	Aluminum, Black PTFE Coated	426	Blue Gard	611	PTFE Integral FKM
100	Alloy 20	310	PVDF Coated	440	Vegetable Fiber	632	Neoprene/Hytrel
110	Alloy Type 316 Stainless Steel	330	Zinc Plated Steel	465	Fiber	633	FKM (Fluorocarbon)/PTFE
111	Alloy Type 316 Stainless Steel (Electro Polished)	331	Chrome Plated Steel	500	Delrin 500	634	EPDM/PTFE
112	Alloy C	332	Aluminum, Electroless Nickel Plated	501	Delrin 570	635	Neoprene/PTFE
113	Alloy Type 316 Stainless Steel (Hand Polished)	333	Carbon Steel, Electroless Nickel Plated	502	Conductive Acetal, ESD-800	637	PTFE, FKM (Fluorocarbon)/PTFE
114	303 Stainless Steel	335	Galvanized Steel	503	Conductive Acetal, Glass-Filled	638	PTFE, Hytrel/PTFE
115	302/304 Stainless Steel	336	Zinc Plated Yellow Brass	505	Acrylic Resin Plastic	639	Nitrile/TFE
117	440-C Stainless Steel (Martensitic)	337	Silver Plated Steel	506	Delrin 150	643	Santoprene/EPDM
120	416 Stainless Steel (Wrought Martensitic)	340	Nickel Plated	520	Injection Molded PVDF Natural color	644	Santoprene/PTFE
123	410 Stainless Steel (Wrought Martensitic)	342	Filled Nylon	521	Conductive PVDF	650	Bonded Santoprene and PTFE
147	Clear Anodized Aluminum	353	Geolast; Color: Black	540	Nylon	654	Santoprene Diaphragm, PTFE Overlay Balls and seals
148	Hardcoat Anodized Aluminum	354	Injection Molded #203-40 Santoprene- Duro 40D +/-5; Color: RED	541	Nylon	656	Santoprene Diaphragm and Check Balls/EPDM Seats
149	2024-T4 Aluminum	355	Thermal Plastic	542	Nylon	661	EPDM/Santoprene
150	6061-T6 Aluminum	356	Hytrel	544	Nylon Injection Molded		
151	6063-T6 Aluminum	357	Injection Molded Polyurethane	550	Polyethylene		Delrin and Hytrel are registered tradenames of E.I. DuPont.
152	2024-T4 Aluminum (2023-T351)	358	Urethane Rubber (Some Applications) (Compression Mold)	551	Glass Filled Polypropylene		Gylon is a registered tradename of Garlock, Inc.
154	Almag 35 Aluminum	359	Urethane Rubber	552	Unfilled Polypropylene		Nylatron is a registered tradename of Polymer Corp.
155	356-T6 Aluminum	360	Nitrile Rubber. Color coded: RED	553	Unfilled Polypropylene		Santoprene is a registered tradename of Exxon Mobil Corp.
156	356-T6 Aluminum	361	FDA Accepted Nitrile	555	Polyvinyl Chloride		Rulon II is a registered tradename of Dixon Industries Corp.
157	Die Cast Aluminum Alloy #380	363	FKM (Fluorocarbon). Color coded: YELLOW	556	Black Vinyl		Ryton is a registered tradename of Phillips Chemical Co.
158	Aluminum Alloy SR-319	364	E.P.D.M. Rubber. Color coded: BLUE	557	Conductive Polypropylene		Valox is a registered tradename of General Electric Co.
159	Anodized Aluminum	365	Neoprene Rubber. Color coded: GREEN	558	Conductive HDPE		SANDPIPER, PortaPump, Tranquilizers and SludgeMaster are registered tradenames of Warren Rupp, Inc
162	Brass, Yellow, Screw Machine Stock	366	Food Grade Nitrile	559	Glass-Filled Conductive Polypropylene		
165	Cast Bronze, 85-5-5-5	368	Food Grade EPDM	570	Rulon II		
166	Bronze, SAE 660	370	Butyl Rubber. Color coded: BROWN	580	Ryton		
167	Bronze, Alloy 954, ASTM B505	371	Philthane (Tuftane)	590	Valox		
170	Bronze, Bearing Type, Oil Impregnated	374	Carboxylated Nitrile	591	Nylatron G-S		
				592	Nylatron NSB		
				600	PTFE (virgin material)		
					Tetrafluorocarbon (TFE)		
				601	PTFE (Bronze and moly filled)		
				602	Filled PTFE		

**WARREN
RUPP, INC.**

Declaration of Conformity

**Manufacturer: Warren Rupp, Inc., 800 N. Main Street
Mansfield, Ohio, 44902 USA**

**Certifies that Air-Operated Double Diaphragm Pump Series: HDB, HDF, M Non-Metallic,
S Non-Metallic, M Metallic, S Metallic, T Series, G Series, U Series, EH and SH High Pressure,
RS Series, W Series, SMA and SPA Submersibles, and Tranquillizer® Surge Suppressors comply with
the European Community Directive 2006/42/EC on Machinery, according to Annex VIII.
This product has used Harmonized Standard EN809:1998+A1:2009, Pumps and Pump Units
for Liquids - Common Safety Requirements, to verify conformance.**

David Roseberry
Signature of authorized person

David Roseberry
Printed name of authorized person

Revision Level: F

October 20, 2005
Date of issue

Engineering Manager
Title

August 23, 2012
Date of revision

DEX
FLUID & MECHANICAL

CE

WARREN RUPP, INC.®

EC Declaration of Conformity

In accordance with ATEX Directive 94/9/EC,
Equipment intended for use in potentially explosive environments.

Manufacturer: Warren Rupp, Inc.®, A Unit of IDEX Corporation
800 North Main Street, P.O. Box 1568, Mansfield, OH 44902 USA

Airvantage-equipped ATEX-Certified Air-Operated
Double Diaphragm Pump Models RHDB2,
RHDF2, RS20, and RS30.

Certificate Number:
Sira 10ATEX1151X Issue: 2
Equipment: AirVantage Air Flow Control Unit

Sira Certification Service
Rake Lane
Eccleston
Chester
CH4 5JN
United Kingdom



Applicable Standard:

AirVantage

EN 60079-0:2009
EN 60079-1:2007
IEC 60079-31:2006

Marking:

II 2 G D
Ex d ib IIB T4 Gb
Ex tb IIIC 135° C Db IP66

Position Sensor

EN 60079-0:2006
EN 60079-11:2007
EN 61241-0:2006
EN 61242-11:2006

Rating (not marked):

II 2 G D
Ex ib IIB T4
Ex ibD 21 T132° C



DATE/APPROVAL/TITLE:
27 MAY 2010

David Roseberry
David Roseberry, Engineering Manager

WARREN RUPP, INC.®

Declaration of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

Manufacturer: Warren Rupp, Inc.®, A Unit of IDEX Corporation
800 North Main Street, P.O. Box 1568, Mansfield, OH 44902 USA

Airvantage-equipped Air-Operated Double
Diaphragm Pump Models RHDB2,
RHDF2, RS20 and RS30.

Certificate Number:
IECEX SIR 10.0110X Issue: 2
Equipment: AirVantage Air Flow Control
Unit

Sira Certification Service

Rake Lane
Eccleston
Chester
CH4 SJN
United Kingdom

Applicable Standard:

AirVantage

IEC 60079-0:2004
IEC 60079-1:2007-4
IEC 60079-31:2008

Marking:

Ex d ib IIB T4 Gb
Ex tb IIIC 135° C Db IP66

Position Sensor

IEC 60079-0:2007-10
IEC 60079-11:2006
IEC 61241-0:2004
IEC 61242-11:2005

Rating (not marked):

Ex ib IIB T4
Ex ibD 21 T132° C



DATE/APPROVAL/TITLE:
27 MAY 2010



David Roseberry
David Roseberry, Engineering Manager